THE IRON TRADE REVIEW

VOL. XXXI. CLEVELAND, O. DECEMBER 8, 1898. CHICAGO, ILL. NUMBER 49

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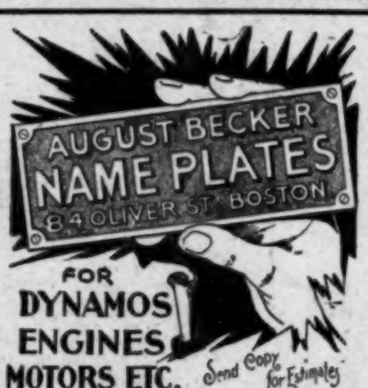

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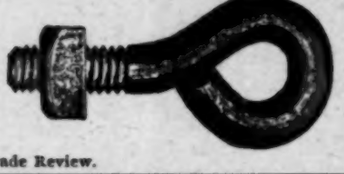

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THE IRON TRADE REVIEW

VOLUME XXXI. CLEVELAND, O. DECEMBER 8, 1898. CHICAGO, ILL. NUMBER 49

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

To the strong features of the iron market noted last week in connection with the heavy sales of rails has been added another of great significance. Sales of Bessemer iron aggregating more than 150,000 tons have been made in the week, in Pittsburg and the valleys, the bulk of it at $10 in the valley, the price of the associated merchant furnaces. It need not be said that these transactions, which establish the basis of much of the business for the first half of 1899, have begotten a buoyant feeling, and, taken in connection with other phases of the situation, justify a very sanguine view of the future. The valley furnacemen have made a long and a hard fight for a price giving a profit—small, to be sure, for some of them—and they have established it against an equally stubborn fight by steel makers. The result is an index of the prodigious consumption of Bessemer steel and is a sign-board for 1899 that can scarcely be misunderstood. Before the $10 price of the furnacemen was established on Saturday something like 50,000 tons of outside Bessemer iron was picked up from all available sources at a price slightly below $10, furnace. Rail business has not slackened in the week. Sales east and west have brought the total booked beyond 1,000,000 tons. The Cambria Iron Co., whose position puts it close to Central Western mills in ability to attain a low cost, is now reported to be included in the understanding reached by the Pittsburg, Chicago and Pueblo mills. In the past week's tonnage Eastern roads have been well represented, and further large contracts have been closed with Western lines. The leading mills are crowded to their utmost on 1898 deliveries and are sold far into 1899. The situation as to girder rails has not developed, but the expectation of the manufacturers is that this business will share the expansion in other lines promised for 1899. The advance in Bessemer iron has given firmness to the billet market, and buyers of steel who have held off are now showing some desire to cover for the first half of the year. The mills have made good sales for the first quarter of the new year, and for such delivery the price is now firm at $15.50 Pittsburg maker's mill. For second quarter delivery sellers are disposed to ask more money, as it is evident that Bessemer converters in the Central West will be occupied to full capacity. The excellent business in rolling stock that has brought a large tonnage to the mills in the past month is even increasing. In the last two weeks heavy orders for bars and axles have been placed and full winter schedules will be the rule at Central Western mills. Car and locomotive works have not been better occupied in several years. Chicago reports a good business in bridge material, two sales amounting to 11,000 tons. Some lines are affected by the slowing down usual at the close of the year, but the dominating feeling throughout the trade is one of unusual strength. Northern foundry iron is firmer, in sympathy with Bessemer, and the Southern situation has not changed. There is an unusual December movement in foundry grades.

PITTSBURG.

OFFICE OF *The Iron Trade Review and Industrial World.*
705 PUBLICATION BUILDING, Dec. 7.

The booking of such a heavy rail tonnage is the main cause among several which have given the raw iron and steel market a strength unusual for this time of year. Steel makers have come into the market and bought pig iron heavily, while steel buyers have seen such promise of strength in the future that they have become anxious inquirers and to a certain extent purchasers. In finished lines the change is slight, but is in the direction of easier values. Despite unfavorable ocean freights, it is possible to do considerable business abroad in steel, and this factor is now confidently relied upon to sustain the market at times which formerly would have been marked by a depression, from which recovery was not always easy.

PIG IRON.—A number of steel makers were forced late last week to cover to a considerable extent for the requirements of the next half year, which resulted in a heavy buying movement. The odd lots of pig which stood over the market for some time were rapidly closed out at advancing prices, and it is claimed that one lot of 40,000 tons held by a broker for some time at $10, valley, was closed out at that figure. Then on Saturday the representative of the valley furnacemen was called upon, and sales were closed that day for three lots of iron, aggregating 147,000 tons, at a straight price of $10, valley furnace. This has put the furnacemen in a strong position, and there seems to be no disposition on their part to sell any more iron below $10.25, valley, for the first quarter of next year, while for the second quarter this figure would scarcely hold good. In forge and foundry irons there has been no special activity. We quote:

Bessemer, valley furnace	$10.00
Bessemer, Pittsburg	$10.50 to 10.60
No. 1 Foundry	10.50 to 10.60
No. 2 Foundry	10.00 to 10.25
No. 3 Foundry	9.65 to 9.85
Gray Forge, valley furnace	8.75 to 8.85
Gray Forge, Pittsburg	9.25 to 9.30

BILLETS AND RODS.—A fairly large tonnage of billets has been placed during the last week, and producers generally are so well sold into the first quarter of next year that higher prices are named. Scarcely any spot billets can be had. Some moderate sized orders could be placed for delivery early next year at $15.50 maker's mill, Pittsburg, but for round lots or more extended deliveries somewhat more would have to be paid. Sheet and tin plate bars have not taken part in the advance on account of the general stoppage of the tin mills for stock taking preparatory to going into the consolidation, which has cut off specifications, while an uncertainty prevails as to the policy of the new company which is to take hold. Wire rods are firm at $20.50 to $20.75, with no indication of a decline.

PLATES.—The market is without notable change and we continue to quote: Tank, 1.15c; shell steel, 1.20c; flange, 1.25c; fire-box, 2c and upwards.

RAILS AND TRACK MATERIAL.—Prices have firmed up somewhat since the heavy selling recorded last week, but there is still considerable tonnage to be placed. The price at Pittsburg seems to be between $17 and $18. Further sales have been made in the past week, and more is under negotiation. The girder rail matter is not yet fixed. Track materials continue in good demand, and we quote: Spikes, 1.45c; track bolts, 1.65c to 1.70c; splice bars, 1.10c to 1.15c; links and pins are quoted from 1.20c to 1.27½c.

SHEETS.—There is a slight measure of recovery in the sheet

iron trade, caused by very heavy inquiry and moderate sales, but prices have not changed except in the direction of firming up slightly. For spot delivery 1.85c is the ruling price for No. 28 common, and for the first quarter of next year, 1.90c is generally quoted, though sales have been made within the past week at a shade under this figuure. In galvanized iron there is greater strength, owing to a further rise in spelter and a fairly good demand, but we still quote 80 and 7½ per cent off list, with a 15-cent freight allowance.

IRON AND STEEL SKELP.—Steel skelp has not varied materially, but iron skelp has gone off 2½ cents a hundred since last report. We now quote: Grooved iron skelp, 1.05c to 1.07½c; sheared iron skelp, 1.17½c to 1.20c; grooved steel skelp, .97½c to 1.05c; sheared steel skelp, 1.10c to 1.12½c.

FERRO-MANGANESE AND SPIEGEL.—These lines are without change. Ferro-manganese is quoted at $50 for 80 per cent domestic, and spiegel at $23.50 and $24, though the lower price may be shaded in some quarters.

SPELTER.—The scarcity in this product continues. Latest quotations are 5.30c St. Louis, and 5.45c Pittsburg, an advance of 15 cents a hundred in the week. Zinc ore has advanced considerably.

PIPES AND TUBES.—Deliveries on current contracts are keeping the pipe mills satisfactorily employed, despite the fact that there is little new business to be placed on account of its being so near the end of the year. The outlook is favorable for a good buying movement by, say, the middle of January. Prices are reported as still well maintained and we still quote additional discounts six tens for less than carload lots, and six tens and five for carloads. Base discounts are: Butt weld, black, 55 per cent off; lap weld, black, 65 per cent off; butt weld, galvanized, 47½ per cent off; lap weld, galvanized, 52½ per cent off. Discounts on merchant boiler tubes are as follows: 2¼-inch and smaller, 72½ per cent off; 2½ inch and larger, 75 per cent off. Inserted joint casing is quoted at 60 off and screw and socket joint casing at 60 and 10 per cent off.

STRUCTURAL MATERIAL.—Structural mills are still kept busy, and the tonnage of deliveries is satisfactory. No contracts of importance are in the market. The scale of prices is unchanged, as follows: Beams and channels, 3 to 15 inches, 1.20c; 18 to 24 inches, 1.30c; tees, 1.25c; zees, 1.20c, and angles, 1.10c. Universal plates are generally quoted at 1.10c but some firms are holding for 1.15c and are getting business.

OLD MATERIAL.—The buying has been of small amount during the past week, on account of the approach of the end of the year, but the schedule of prices remains about the same. We quote: Old steel rails, long lengths, $9.75; cut, $10 to $10.25; old iron rails, $13.75; wrought iron scrap, $11.50, net valley; cast borings, $6; busheling scrap, $9, net; car wheels, $10.25, gross; cast scrap, $9, gross; iron axles, $6, net; steel axles, $12.50, gross; charcoal scrap, $10, gross; wrought turnings, $6.75, net, valley.

CHICAGO.

OFFICE OF *The Iron Trade Review and Industrial World*, 1522 MONADNOCK BLOCK, Dec. 7.

There has been considerable activity in most lines of iron and steel, the demand appearing to increase for some shapes, while for others it remains steady. The largest sales of the week were of rails. Orders were placed aggregating over 250,000 tons, a large proportion of which were taken by the Chicago mills. There are still a number of orders in the market, which are expected to be placed within a short time. It is believed that with the large business closed up in rails, an advance in prices is quite certain. The railroads have been large buyers of other material in the week, also. Orders for cars were of good size, and local bridge works have taken contracts for bridges from Western roads which call for over 10,000 tons of material. In other lines business has been excellent, and includes some good orders.

PIG IRON.—There has been quite an increase in the demand in the past week and several quite large orders have been placed. The aggregate tonnage closed has been unexpectedly large, considering the season of the year, although most of the business was in comparatively small lots, from 500 tons down. A number of unsatisfied inquiries are still in the market, and these, it is thought, will be closed very soon. The furnaces, both North and South, are very firm in their views, and are making absolutely no concessions to secure business. Buyers are taking their iron as rapidly as the furnaces can get it to them, and in many cases this is not fast enough to suit the buyer's requirements. Quotations remain unchanged:

Lake Sup. Charcoal	$11 50 @ $13 00	Southern Coke No. 3	$10 35 @ 10 60
Local Coke Fdy. No. 1	11 50 @ 12 00	Southern No. 1 Soft	10 85 @ 11 10
Local Coke Fdy. No. 2	11 00 @ 11 50	Southern No. 2 Soft	10 60 @ 10 85
Local Coke Fdy. No. 3	10 75 @ 11 00	Southern Silveries	11 25 @ 11 50
Local Scotch Fdy. No. 1	11 50 @ 12 00	Jackson Co. Silveries	12 50 @ 14 50
Local Scotch Fdy. No. 2	11 00 @ 11 50	Ohio Strong Softeners	12 00 @ 12 50
Local Scotch Fdy. No. 3	10 75 @ 11 00	Alabama Car Wheel	15 00 @ 16 00
Southern Coke No. 1	10 85 @ 10	Malleable Bessemer	11 50 @ 12 00
Southern Coke No. 2	10 60 @ 10 85	Coke Bessemer	11 50 @ 12 00

BARS.—There was quite a large aggregate of sales last week, most of them for small lots. Some buyers are not disposed to take their iron as fast as the mills would like, owing to the fact that the end of the year is so close, and the inventory is easier with small stock on hand. As a consequence it is possible to obtain steel bars from billet stock as low as 1.05c for December delivery. Common iron bars are quoted at 1.02½c to 1.10c, according to the quantity and the delivery required. Guaranteed iron is quoted at 1.10c to 1.15c.

RAILS AND TRACK SUPPLIES.—Sales of rails in this market last week were large, aggregating over 100,000 tons. The agreed price of $18, Chicago, is said to have been obtained in every case. Reports have been circulated of sales of rails in this territory by Pennsylvania mills outside of the agreement, but if any were made they were small and unimportant. The pool mills have secured nearly all the business west of Pittsburg. In addition to the mills named last week, it is ascertained that the Cambria Iron Co., Johnstown, Pa., is now included in the agreement. The pool is then composed of the Cambria Iron Co., the Carnegie Steel Co., the Federal Steel Co., and the Colorado Fuel & Iron Co. Quotations are made as follows: Standard section rails, $18, Chicago; light rails, $20 and upwards; steel splice bars, 1.15c to 1.25c; track bolts with square nuts, 1.80c to 1.90c; hexagon nuts, 1.90c to 2c; spikes, 1.55c to 1.60c.

BILLETS AND RODS.—No sales were made in this market last week. In rods a business of over 11,000 tons was closed by the local mills, at an average price of $22 per ton. There is still a large demand for rods unsatisfied.

CAR ORDERS.—One order for 1,200 cars was placed in this market last week by a Western road, and several smaller orders were given out. Many more cars are being figured on now. The demand for car material of all kinds is very heavy and sales last week were excellent.

STRUCTURAL MATERIAL.—The American Bridge & Iron Works gave its order last week for 5,000 tons of material for railroad bridges. Another order of the same class, of 6,000 tons, will be placed before the end of the week. Considerable business has been done in small lots, and the demand indicates a continuance of the trade. No large buildings were let last week, and there are none to be let soon, but a number of building projects are being figured on, and will come up in the near future. Quotations are as follows: Beams, 15 inch and under, 1.35c to 1.40c; 18-inch and over, 1.45c to 1.50c; angles, 1.25c to 1.30c; plates, 1.20c to 1.30c; tees, 1.40c to 1.45c; zees, 1.35c to 1.40c. Small lots from stock are quoted at ¼c to ½c higher.

PLATES.—The local mills took orders last week for a large tonnage of various kinds of plates, including one order of over 5,000 tons. The demand is very heavy, and sales by outside mills were excellent. A number of large inquiries are still in the market. Quotations are made as follows: Tank plates, 1.20c to 1.30c; flange steel, 1.30c to 1.40c; fire box steel, 1.85c to 5c.

SHEETS.—Demand has been good, and quite large sales of both black and galvanized sheets were made last week. The market is firm at 2c to 2.05c for No. 28 black and 80 and 7½ per cent discount for galvanized.

SCRAP.—This branch of the market is still quiet, although one or two good sales of old rails were made last week. Dealers' selling prices are as follows:

Old iron rails, gross	$12 50 @ $12 75	Axles, net	$14 25 @ $14 75
Old steel rails, long, gr.	10 50 @ 11 00	Cast borings, net	4 25 @ 4 50
Old steel rails, short	8 75 @ 9 00	Wrought turnings, net	6 00 @ 6 50
Old wheels, gross	11 00 @ 11 50	Axle turnings, net	7 00 @ 7 25
Railroad forge, net	11 50 @ 12 00	Mixed steel, gross	7 45 @ 7 50
Dealer's forge, net	10 00 @ 10 50	Stove plates, net	5 75 @ 6 00
No. 1 mill, net	7 50 @ 8 00	Heavy melting stee, gr.	8 25 @ 8 40
Heavy cast, net	8 50 @ 9 00	Old iron splice b., net	12 75 @ 13 00
Malleable cast, net	8 00 @ 8 50		

MERCHANT STEEL.—Several good sales were made last week,

and the aggregate tonnage closed was very satisfactory to the mills. The demand shows every sign of keeping up for some time. Quotations follow: Open-hearth spring, tire and machinery steel, 1.65c to 1.75c; smooth finished machinery steel, 1.60c to 1.70c; smooth finished tire, 1.50c to 1.60c; tool-steel, 5.50c to 7.50c; specials, 11c and upwards.

CLEVELAND.

OFFICE OF *The Iron Trade Review and Industrial World.*
27 VINCENT ST., Dec. 7.

Ore shipments are still being made from Escanaba and Two Harbors, and two or three cargoes are to be loaded at Marquette and Ashland. Official figures show that the total shipments from all ports to Dec. 1 were 13,481,711 gross tons, as compared with 12,187,508 tons to Dec. 1, 1897. It is probable that 100,000 tons and upward are to be added for December water shipments, and that when all-rail shipments are added, the year's total will be something over 13,700,000 tons. There are indications that purchases of mines by consumers of ore are not at an end. Negotiations bring out substantially higher valuations on desirable mining property than in the past five years. That mining labor is getting its share in the betterment is evidenced by the fact that companies recently granting a 10 per cent advance in wages gave a similar increase one year ago.

PIG IRON.—Heavy buying of Bessemer pig iron in the past week has put the associated valley furnacemen in a position they have not occupied at any time in their eight months' struggle for the establishment of a price yielding a profit. In the last few days of last week sales of iron outside the association were concluded at Pittsburg, aggregating 50,000 tons, this amount being picked up in lots here and there—some of it in the hands of coke companies who had taken it in exchange for coke. That this absolutely cleaned up the non-association iron was demonstrated by the sales that followed, footing up 110,000 tons additional, all this being sold through the agency of the association for shipment to Pittsburg and valley steel works. The price on the 110,000 tons was $10 at furnace; on the 50,000 tons, from 10 to 15 cents below that figure is said to have been paid. Deliveries on the lots of association iron extend over the first half of 1899. So well sold are the furnaces that higher prices are talked of, but there are no quotations but on association iron and none are likely to be made until buyers shall again appear in the market. The whole situation is materially strengthened, and now that the furnacemen's ability to maintain a price is clearly established, the steel market is reinforced, and the entire situation, as it relates to the business of the first half of the next year, is put on a basis of assured strength. Foundry iron, which has held up well on its own account, gains also from the transacstions in Bessemer. Foundry buying is going on week by week, several large lots being included in the past week's purchases, largely at $9.50 to $9.75 valley furnace for No. 2. Forge is firm at $8.75 to $8.85 valley furnace, and quite a little business has been closed in basic. We quote f. o. b. Cleveland:

Bessemer	10 40@10 55	Valley Scotch No. 1	$10 50@10 60
No. 1 Strong Foundry	10 40@10 65	Valley Scotch No. 2	10 15@10 40
No. 2 Strong Foundry	10 15@10 25	Gray Forge	9 40
No. 3 Foundry	9 65@ 9 90	Lake Superior Charcoal	11 50

FINISHED MATERIAL.—New business through local offices is somewhat slack, owing to the season. Recently placed car business will bring a large tonnage to the mills. The New York Central and Lake Shore contracts which go to Central Western car shops, mean 25,000 to 30,000 tons of mill material, in addition to wheels and axles. The large locomotive order for the Lake Shore adds some plate tonnage. Plates are sold at 1.15c Pittsburg for tank, and small orders that fill in are taken at about the same figure as larger business that ties up the mill to close deliveries. Bar mills, with their heavy tonnage, are not getting better prices. On steel bars, Pittsburg quotations are 95c to 1c and the Cleveland and valley markets are on substantially the same basis, prices varying according to the condition of order books. Steel bars in the local market are a trifle weaker. Sheets are unchanged at 1.95c and a shade less, Cleveland, for No. 28. The nail market is dull and a movement is scarcely expected for two months. We quote $1.25, Cleveland for carload lots and $1.30 for small lots. Smooth wire is $1.12½ to $1.15, Cleveland mill, about 50c a ton below the fall price.

CINCINNATI.

Dec. 6.

There has been no change in the price of Southern iron in the past week, but the market is firmer, if possible, than it was a week or ten days ago. The sales for export continue heavy and there has been a number of fair sized orders for home consumption booked. Stocks are being steadily reduced and shipments would be much heavier were it not for the great scarcity of cars. There is a marked improvement in inquiries and everything points to a good buying movement in the near future. Some deals have been closed, ranging from 500 to 1,500 tons of different brands, and in Northern irons there is greater firmness in prices. Some of the Southern furnaces continue to make special prices, although most of them have well filled order books and there is a possibility of a decided shortage in Southern irons later. If ocean room can be obtained, a considerable part of the Birmingham production can be sent abroad. This to a large extent will leave the central district to be supplied by the furnaces favorably located, and it appears that there will be sufficient business to satisfy such producers. The buying movement has only fairly started, and it is expected that business will be good from this time forward. Letters received from prominent foundries scattered throughout the country show them to be full of work, although some complain that they are not able to fill the orders offered them. The last month of the year opens with every prospect of its being the forerunner of a very prosperous new year. We quote f. o. b. Cincinnati: Southern Coke, No. 1 foundry, $10 to $10.25; No. 2, $9.75 to $10; No. 3, $9.25 to $9.50; No. 4 and gray forge, $8.75 to $9; mottled, $8.75 to $9; No. 1 soft, $10 to $10.25; No. 2, soft, $9.75 to $10; Hanging Rock charcoal, No. 1, $14.50 to $15.50; Jackson Co. silvery, No. 1, $12 to $12.50; standard Georgia car wheel, $14.25 to $15.

PHILADELPHIA.

Dec. 6.

The steady strengthening of the market, accompanying an increased production of iron, and in spite of the approach of the weeks usually the quietest in the year, is a matter of satisfaction to producers. While no heavy buying is looked for in the present month, it is plain from the amount of inquiry that a buying movement will be a feature of the early days of the new year. Some furnaces are firmer in their ideas than in November and are not making efforts to close any considerable tonnage until after the turn of the year. It is very evident that work under contract calling for iron and steel is much larger than ever at this season of the year. And the foreign demand is splendidly maintained, though freight room cannot be had at prices that can be paid on this business—indeed, little enough at any price. The steel rail orders closed east and west are thought to have reached nearly 1 000,000 tons, and Eastern mills booked a fair share. Car and locomotive business is reported to have been excellent. So many elements of strength appear in the situation that it does not appear likely the holiday quietness will have any effect on prices. We quote No. 1X foundry iron at $11.50 to $12; No. 2X foundry, $10.75 to $11.25; No. 2, plain, $10.50 to $10.65; standard mill iron, $10 to $10.25; ordinary mill iron, $9.75; basic, $10 to $10 25; Bessemer, $12 to $12.50; low phosphorus, $16.50 to $17. The reported sale of Bessemer iron in the Pittsburg district have strengthened steel billets, which are quoted $17.25, with $17 offered, but it is doubtful if business would now be done at that figure. There is no change in finished material. Mills are well employed, particularly on plates. Structural business is good considering the season. There is a fair tonnage of bars on hand, but sheets are naturally inactive. We quote 1.10c to 1.15c for iron and steel bars; 1.30c to 1.35c for tank plates; 1.25c to 1.30c for angles and 1.40c for beams and channels up to 15 inches. Old material is quiet. We quote heavy steel scrap at $10.25 to $10.50; No. 1 yard scrap, $10.50 to $11; machinery cast scrap, $9.25 to $9.50; wrought turnings, $8 to $8.50; cast borings, $7 to $7.25; old car wheels, $10.25 to $10.50.

THE old Coolidge foundry at Helena, Ark., is to be put in order and run as the Planters' Machine Works, by Fred Wilcox, James Wilcox and Charles Karicote.

THE IRON TRADE REVIEW
AND
INDUSTRIAL WORLD.

DEVOTED TO MACHINERY, METAL-WORKING AND FOUNDRY TRADES AND IRON AND STEEL MANUFACTURE.

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A LATE STRIKE INJUNCTION.

"Government by injunction" has been much railed at in the past two or three years, and it has been the habit with writers who assail the injunction as a weapon against strikes, to refer to these orders by courts to restrain lawlessness, as further evidences of the power of capital to dominate labor. Yet where has a petition been filed, for an injunction against interference by strikers with the operation of works they have left, or with men who would take their places, and the answer has not been made by the strikers' attorney, that they were guilty of none of the acts set forth in the injunction. If guiltless, then why object to the injunction? Is it meant to restrain nothing but lawlessness, and certainly law-abiding citizens have nothing to complain of in laws or orders of courts directed against lawbreakers. But there is one feature of some of these orders that seems to awaken the special resentment of those enjoined, and that is the portion directed against the use of the foul epithets that have been a favorite strike weapon, and in more than one case have led to fatal encounters. As an example we append the latest published injunction—that granted temporarily against the machinists' union at Denver, Col., on petition of the F. M. Davis Iron Works Co. The company had discharged certain members of the union and a strike followed, attended with incidents too deplorably familiar to need detailing. The injunction requires the defendants to appear

or judgment by default will be taken against you according to the prayer of the complaint, that you and each and every one of you, until the order of said court, you and each of your servants, agents, attorneys, employes, and all persons acting under the control, authority, or direction of your or either of you, and all officers, agents and members of you, the said International Association of Machinists No 47, do strictly refrain and desist from at any time, either hailing, saluting or addressing the employes of plaintiff or any of them or those seeking employment at the shops or works of plaintiff, as "scabs" or by other foul or offensive names, words or epithets, whatsoever; and from assaulting, beating, wounding, or by any means whatsoever, threatening violence to or against the said employes of plaintiff or any of them, or those seeking or proposing to become employes of plaintiff, or any such persons whatsoever; and from addressing such persons or any of them, touching their engaging or continuing in the service of plaintiff, otherwise than by the expressed consent of such persons; and that you and every one of you do desist and refrain from instituting or setting on foot any boycott against the works of plaintiff, or by any way or means whatsoever, threatening bodily or financial injury against any person who may be or continue in the employment of plaintiff; and from any display of force, preventing or intimidating any person from so continuing in the employment of plaintiff; and from by any way or means whatsoever, boycotting the plaintiff or the works or factory of plaintiff, or its products; or by any threats of bodily or financial injury, or display of force, intimidating or preventing any person from dealing with plaintiff, or from purchasing, selling or using the product of the works and factory of plaintiff; and from soliciting or persuading any other labor organization to set on foot such boycott, or to any threats of injury or display of force, to intimidate any person from dealing with plaintiff, or from purchasing, selling or using the product of the works and factory of said plaintiff.

The day may come in our industrial history when a document like the above, which is probably one of the most sweeping forms of injunction yet issued, will not sound so strange. Not, we take it, because the order will be interpreted as abridging any privilege which strikers can justly claim; rather, because the lesson will have been so well learned, at length, that the right to strike and thus to stop the operation of a plant, carries with it no license to assail either with words or blows the man who is willing to work under the terms and conditions offered. The rights of the portion of the community that is not on strike will be learned at length, we believe, even though just now so many unions make the mistake of seeing no right but that of the men who have voluntarily given up employment. We reprint the vital part of the Denver injunction in full because it so completely covers the lines of conduct in connection with strikes, that cannot be justified on moral or legal grounds.

AN ANGLO-AMERICAN ORE ALLIANCE.

Commenting on some recent statements by Mr. Carnegie in which he showed the great advantage of the United States over Great Britain, in its low costs of the materials for iron and steel making, the London *Iron and Coal Trades Review* intimates that English iron masters are not so severely put to it in the matter of ore supply and coke costs as we on this side have been used to saying. Our contemporary would have it understood that it is an error to say that Great Britain cannot make coke under $2.50 a ton. It admits that the price of coke is high in Great Britain now, but claims that in some of the 14 chief coal-fields of the United Kingdom, coke can be made, "in normal times, and with proper modern provision for utilizing waste heat and by-products," at half that figure. But our contemporary, in this unsupported claim, brushes past the fact that the present methods of coke making in the two countries are practically the same, and that the advantages of saving waste heat and by-products are still open in equal measure to the iron trade of the United States. Any lowering of cost possible in Great Britain thus involves a like reduction from the present basis in the United States,

and the handicap against Great Britain would still remain.

More surprising is the claim made concerning ore supplies available for Great Britain. Against the unequaled deposits of the Lake Superior region, which are assured the steel trade of the United States for years to come, our contemporary puts up the glittering generality that "the ore-producing world is bounded by no Pillars of Hercules, and that the fields open to Great Britain are at least as numerous, and possibly as rich and abundant as those available to the United States." Magnificent assurance! These rich and abundant possibilities are then indicated: "Large supplies from Sweden and Norway, at a cheap price"—referring to the fields on the Arctic border, visited by the Iron and Steel Institute last August; "almost illimitable sources of ore supply untapped," in Spain, failing the Bilbao supply, as is granted. But as if that were not enough, our boasted monopoly of the Lake Superior ores is demolished in one fell stroke, for, listen! "it has even been proposed to ship Lake Superior ores to Great Britain, and it need not excite surprise should it come about that an all-water route from the ports of Duluth, Escanaba, or Marquette, may ultimately give to this country those very ores at almost as low a price as they are now, via a long railway haul and with broken bulk, delivered to Pennsylvania furnaces."

Really, those unfortunate Pennsylvania furnaces, whose ore comes to them with the terrible handicap of so long a railway haul and the dreadful drawback of broken bulk, should make some effort to suppress their envy, as they see those magnificent freighters sailing by, bearing their precious Lake Superior ores to the triumphant furnaces of the British Isles. Indeed, mayhap British cunning will go yet farther. We scarce dare entertain the throught that British gold might even corner the Lake Superior ore supply and bag it all across the Atlantic. Then where would be the boasted American supremacy in iron and steel?

But putting so violent an assumption aside for the moment, let us try to imagine the American steel maker eking out an existence by shipping his steel into British ports, while the British steel maker pays ocean freight on two tons of ore for one of steel and counts himself happy to have outwitted Yankee shrewdness and administered a salutary rebuke to American "bounce."

THE iron trade has had some little preliminary experience of the effect of the Wall Street regime in iron and steel securities. In the boom literature that has flooded trade circles pending the organization of the new tin plate combination, would-be investors have had their cupidity stimulated by estimates of 8,000,000 boxes yearly consumption and a profit of 50 cents on a box. Never was $4,000,000 made to grow more easily than on this latest plant of the promoter's hot house. It is well known that there cannot be such control of the market in the United States as to permit the consolidated company to make prices yielding 50 cents profit on the box. It is equally true that the consumption of domestic plates in the United States is still considerably short of 8,000,000 boxes. Yet these difficulties of fact seem to have been no obstacle to the professional gentlemen to whom the tin plate industry—that latest and most conspicuous product of our protective system—is to be hereafter a foot ball of the street. Similarly the facts about the rail situation have not deterred sundry operators on Wall Street from sending broadcast the story that hundreds of thousands of tons of rails had been sold at an advance of $1 a ton. As a matter of fact the bulk of the sales made were at prices below what had been quoted for months preceding. But the point seems to be that a stock whose value was contingent on rail profits was to be boomed in the interst of speculators who had taken hold of it for temporary purposes. More than ever, under these conditions, will the iron trade depend upon well-tried sources, for its information upon market movements.

Personal.

President Goltra, of the American Steel Foundry Co., Granite City, Ill., leaves this week for St. Petersburg, Russia, on a business trip.

E. A. Uehling, inventor of the Uehling pig iron casting apparatus, has gone to England on business connected with the English company handling his patents.

Thomas Glover, of the firm of Glover Bros., iron founders, died at Philadelphia, Nov. 28, of inflammation of the brain. Mr. Glover was born in England 56 years ago, and came to this country at an early age. For several years he was foreman of the foundry of the Morris & Tasker Co. The firm of Glover Bros consisted of Mr. Glover and his brother, John H. Glover, and was started in Frankford about 13 years ago. Mr. Glover served in the Union army during the Civil War. He was a member of the executive committee of the Foundrymen's Association.

The canvass of ballots at the meeting of the American Society of Mechanical Engineers at New York, last week, showed the following elected officers for the coming year: President—George W. Melville, Washington, D. C. Vice-presidents—E. D. Meier, St. Louis, Mo.; Geo. R. Stetson, New Bedford, Mass.; B. H. Warren, Pittsburg, Pa. Treasurer—William H. Wiley, New York. Managers—Edgar C. Felton, Harrisburg, Pa.; R. H. Soule, Chicago, Ill.; A. M. Goodale, Waltham, Mass.

F. A. Smythe, owing to the steady expansion of the business of the Lorain Foundry Co., of which he is president, has severed his connection with the Lorain Steel Co., and will devote all his time to the work of the foundry company.

John R. Davies, a steel worker at the Duquesne Steel Works, is to go on a three months' trip to Europe at the expense of the Carnegie Steel Co. Such a trip is given each year to one of the workmen of the company who is adjudged to be worthy this recognition by reason of faithful services.

IT is reported from Pittsburg that the manufacturers of ingot molds in that district have agreed to advance the price from $14 to $15.50 a ton. It is doubtful if such an arrangement has been entered into, since there are factors in the trade which heretofore have made any such effort impossible, and it is difficult to see how the obstacles to agreement could be removed. It is well known that the price of ingot molds has been very low for some time—too low for most manufacturers. No doubt an advance is being asked sufficient to cover the advance in Bessemer pig iron.

A MEETING of manufacturers of shafting was held at the Schenley Hotel, Pittsburg, Nov. 29 and 30. Nearly all the mills were represented and it appeared from reports that agreed prices have been well held by the members of the association, with perhaps one exception. The volume of business has been excellent for some months, and the outlook is regarded to be quite satisfactory.

SEMI-STEEL (?) AND TESTING CAST IRON.

TO THE EDITOR:

The interesting article by Titus Ulke, M. E., which appeared in *The Iron Trade Review* on Dec. 1, contained among a number of valuable data some statements which do not tend to clear away the "fog of mystery" surrounding the production of high grade cast iron. Far from wishing to detract from the value of the information thus made available for those founders who are not abreast of the times, there are nevertheless conclusions arrived at which seem logical enough from the standpoint of a Government inspector, but would, if adopted generally, mean endless trouble and uncertainty to the foundry trade.

But first of all the writer notes with regret the use of the term "semi-steel." What does this mean? Where would the division lines be which separate this material from either cast iron or steel? In the days gone by, when nothing was known of cast iron beyond the fact that with given brands of pig iron certain kinds of castings resulted, the addition of steel scrap was so radical a change that the term semi steel was selected by men with sound business judgment to profit by this discovery to the greatest extent possible.

In these days of progress when we are beginning to see things as they really are, the advertising element is being separated very sharply from our technical classifications. Our great universities and industrial bodies of note refuse to go on record as endorsing so-and-so's scheme, which may be ever so meritorious, but comes down to diverting as many dollars into his pocket as can be gotten there in this way. It is unfortunate, therefore, to see any one with a technical education make use of a term calculated to give an erroneous impression, as if it were universally recognized.

The subject has been thoroughly discussed and the fallacy exposed by Mr. Outerbridge and others; for the lowering of the carbon contents in the main accounts for an increase in strength and ductility of the strong over the weak grades of cast iron. The addition of steel scrap has simply extended the upper strength limit from 25,000 to 40,000 lbs. per square inch and the ductility from 0.3 up to about 0.75 per cent, but has not made a new class of material by any means, all the properties being those of cast iron. The very example quoted contains but little less carbon than some standard brands of pig iron, and is far beyond the division line between steel and cast iron.

Until representative bodies of men actively engaged in the production and use of castings find it necessary to revise the classification now existing for centuries (at least one attempt to do so has been frowned down), the use of the term semi-steel conveys to the minds of modern men an impression similar to the name of some patent medicine.

Mr. Ulke very properly discusses the causes for obtaining unreliable results when specimens of cast iron are tested. The cutting of samples from parts of castings artificially strengthened, let us say (and every founder knows how to accomplish this if he chooses), or even if cut from normal castings which vary in thickness, gives test specimens which result in figures so hopelessly discordant that one is all at sea. Any one who will take the trouble to cast a set of bars of various cross sections on the plan carried out for the American Foundrymen's Association's set of tests will quickly see by the fractures alone what radical differences in structure are due to size and shape.

While, therefore, the writer is pleased to see this fact recognized in Mr. Ulke's discussion, the recommendations he makes for universal adoption are quite another matter. At the outset the attempt is made to obtain the casting conditions by attaching the test specimen to the casting itself, a thing which every founder knows is accompanied by so many circumstances affecting the results that proper representation is hopeless. Only one point need be mentioned: Test bars thus placed at the top, middle, and bottom of a cylinder casting will not give concordant results.

Again, the bars are machined before testing, which means that the casting is relieved of its strains to a considerable extent and the results are artificial, being up to 15 per cent higher than the iron can stand in service.

Here, then, is enough to condemn this method of testing at once, were it not for the fact that something better should be provided. The recent impetus given to the study of cast iron in all its phases will certainly develop some rational methods of testing it. The solution of the problem of specifications, however, will very likely leave the path outlined by Mr. Ulke and drift toward a more liberal basis—a basis which will hold the manufacturer to the production of the best grade of iron without the annoyance of improperly devised and arbitrary methods of running his business for him.

RICHARD MOLDENKE.

Pittsburg.

PUBLICATIONS RECEIVED.

The American Pegamoid Co., 346 Broadway, New York, describes its products in two handy pamphlets—one issued under the title "What is 'Pegamoid'" and the other bearing the title "'Pegamoid' Paints and Lacquers." The Pegamoid process is defined as "the application in a liquid form of a composition which, by impregnating the fibres or pores of the substances treated, has the effect of water-proofing, strengthening and generally protecting the material used." It may be applied to fabrics, papers and skins, and as paint or laquer to iron, steel, wood and stone work. The Pegamoid company's structural metal protective is described as elastic, tough, durable and resistent. Metals painted with the structural metal protective are proof against corrosion and the action of heat, cold, water, moist air, sewage, and in some cases solutions of chemicals. Referring to the danger from rusting of steel frames in city structures, the manufacturers say: "The metal is exposed to the action of water and sewage in the foundations, and to moisture and oxidation above. The metal framework is encased in masonry so that the extent of deterioration cannot be observed until some unexpected accident due to the weakening of the structure occurs. There is, therefore, a great field for a paint that will really protect a steel surface against corrosion. The structural metal protective has remarkably strong clinging powers and retains even after long exposure to air or immersion in water a tough, pliant rubbery nature, which allows it to give under impact but not to crack or spring off. Thin metal painted with it can be bent many times without breaking the skin; in fact, the metal often breaks under repeated bending before the skin shows a rupture." A description is also given of "brass lacquette," a transparent lacquer for polished brass surfaces, such as bedsteads, lamps, gas brackets, etc.

The B. F. Sturtevant Co., of Boston, Mass., has just issued a second edition of its suggestive pamphlet, Bulletin E, entitled "Draft without a Chimney." It will be mailed on application.

The Gobeille Pattern Co., Cleveland, in a green and black reminder to foundrymen, refer to the speed of their operations and the quality of their work.

An illuminated naval souvenir sent out by the Berger Mfg. Co., Canton, O., calls attention to its metal ceilings—the number and variety of designs and the artistic character of its patterns. Designs and prices are submitted on all prospective work.

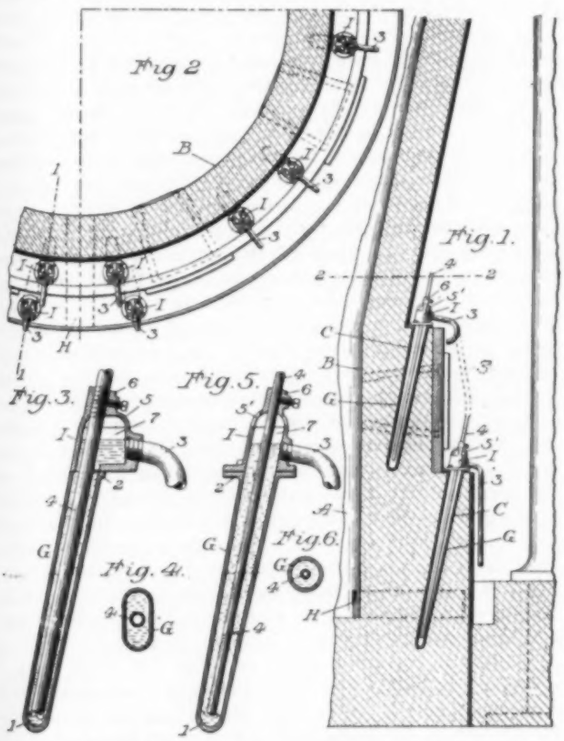
In the second edition of the general catalogue of the Whiting Foundry Equipment Co., Harvey, Ill., details are given of a variety of compressed air, gantry and traveling cranes, showing installations made by the company for differing service. There are 52 pages in all, devoted to descriptions of all the lines of equipment needed in the foundry, together with tables and other information. Supplementary catalogues are issued, each referring to some particular line.

THE Hansell Spring Co., Ambler, Pa., has failed for $75,000. The works were recently established in the buildings of the Keasby & Mattison Co. Dr. R. V. Mattison, president of the latter company, advanced money to further the business. Dr. Mattison has notified the creditors that he will be personally responsible for the debts contracted by the company during his connection with it.

THE petition in bankruptcy filed at Toledo, O., by Isaac D. Smead puts the liabilities at $900,000, with no assets. The petitioner was at one time sole proprietor of Isaac D. Smead & Co.'s works, Toledo and Kansas City, half owner of Smead, Wills & Co., of Philadelphia, and two-thirds owner of the Smead Foundry Co., of Toledo.

COOLING DEVICE FOR FURNACE WALLS.

An improved method of protecting the tuyere-wall, hearth wall and tapping-holes of blast furnaces is provided in a recent invention of A. P. Gaines, of the Tennessee Coal, Iron & Railroad Co.'s South Pittsburg, Tenn., furnaces. It consists in part in the use of a "jamb-pipe," which by protecting the tapping-holes prevents their enlargement due to the cutting out of the furnace walls at the sides or jambs. The construction and application of the device are shown in the illustrations, of which Fig. 1 is a vertical section of a furnace wall and Fig. 2 a horizontal plan section. Fig. 3 is a vertical section of the jamb pipe and Fig. 4 a section of a modified form, Figs. 5 and 6 being respectively transverse sections of the two. The jamb-pipes are inserted in inclined recesses C in the furnace walls, the pipe consisting of a copper or bronze tube G, closed at its lower end and having a seat 2 at its upper open end for the attachment of the cap I. The tube may be of either section shown, and tapered, so that its body is conical or wedge-shaped according as the section is circular or elongated. The cap forms a water-tight contact with the upper open end of the jamb-pipe, making a reservoir 7 for the water as it rises in the jamb-pipe and may be offset at the



top of the pipe, as in Fig. 3, or not, as in Fig. 5. An overflow pipe 3 is connected to the outer side of this basin, and the latter may be closed by a cap having a solid web 5 or with an open web 5'. In either case the top of the basin supports the hub 6, through which the inlet pipe 4 is inserted into the jamb-pipe, extending to within a short distance of the bottom, thus forming an annular chamber between the inner wall of the tube and the outer wall of the inlet-pipe. Through this chamber the water circulates in an upward direction, and is secured by a set-screw. When the closed cap is used, the jamb-pipes may be applied in series with respect to the circulation of the cooling liquid by connecting the discharge pipe 3 of any one jamb-pipe to the inlet-pipe 4 of the other adjacent jamb-pipe, and any additional number of jamb-pipes may be thus connected.

The advantages of this device are: First, that it is safe from explosions which occur so often around metal notch where water cooling devices are used. Second, it can be readily examined inside, and obstructions to free water removed by taking off the cap without the necessity of removing the pipe from the furnace. This, however, is easily done when desired for any other purpose. Further, this device is particularly easy of application to modern furnace construction (which favors practically solid metal shells around hearth and tuyere walls), since no holes or appertures are required to be cut, either in the tuyere jacket or in the hearth jacket. The water circulation being in a vertical direction is thorough, and under full control.

In using these pipes for cooling hearth and tuyere walls, a thicker wall can be used than hitherto, which may prove of considerable value since thicker walls materially lessen the loss of heat by radiation, giving more even temperature of the hearth and crucible. With the jamb-pipe the tendency to break out around and underneath the hearth jacket will be lessened, and the pipe can be used wherever a weak place is shown in the walls, by drilling down in the brick and setting one of the pipes at the point where it is shown that the wall is weakening. They are now being placed in one of the South Pittsburg furnaces, being set at an angle of about 75 degrees, and the jamb-pipe being about seven feet long, tapering from 3½ inches down to a point.

IT is stated that the Birmingham Rolling Mill Co., Birmingham, Ala., makes its assignment as a preliminary to reorganization. The assets are put at $1,000,000, and liabilities, exclusive of capital stock, at $200,000 to $300,000. The company was organized in 1880, with a capital stock of $250,000, which has been increased from time to time until two years ago, when it had reached $500,000. Bonds to the amount of $200,000 were issued, but were never sold, being used for collateral purposes in effecting loans. Eighteen months ago $75,000 additional of preferred stock was issued and sold, and the proceeds used for erecting a 120-ton steel mill. For years the company paid large dividends. These were paid out as rapidly as earned, and no accumulation saved. Just as the panic came on the company borrowed a large sum with which to put in new labor-saving machinery, and, as the price of its product went down, it never recovered from this backset. J. P. Weller, a local scrap iron dealer, and others, filed a petition in the Federal Court to put the company into involuntary bankruptcy.

IT is reported that the Federal Steel Co. is planning to build a railroad connecting its Lorain plant with Cleveland. Surveys are known to have been under way recently, the purpose of which is to secure an eligible route from Lorain to connect with the Belt Line of Cleveland. Such a connection would give an outlet over all the lines running into Cleveland and provide the steel company with terminals which would entitle it to its percentage on all outgoing and incoming traffic, as the Illinois Steel Co. has had for so long, with its Calumet line. While as yet there is no closer relation between the Federal Steel Co. and the American Steel & Wire Co. than that existing between a producer and a customer, it is certain that a large tonnage of steel will be shipped regularly from Lorain to the mills of the latter company at Cleveland. There is no official confirmation of the report outlined above; but it is believed that if the plan is carried out the Cleveland Belt Line will also be purchased by the steel company.

THE Pennsylvania Car Wheel Co., Allegheny, Pa., is making some additions to increase its capacity. A storage house for flasks, etc., has been under construction for about three weeks, and a new foundry building is to be erected.

REID & WARREN, pattern makers, 104 Canal street, Cleveland, have been doing a good business in general lines, railroad joint work being a feature. They have done work in malleable lines, also—the overflow from the pattern departments of local malleable concerns. Recently they have done considerable in electrical machinery and furnace patterns. The facilities of the concern enable it to fill orders promptly and to do satisfactory work.

IT is reported that the working schedule at the National Tube Works, McKeesport, Pa., will be so arranged that the Saturday half holiday will be given regularly after Jan. 1.

GAS is so scarce that the Wetherald rolling mill at Frankton, Ind., is working only half time in its puddling department. Work on new wells is being pushed.

THE Union Iron Works, Spokane, Wash., have increased their capital from $15,000 to $60,000. Some new machinery is to be installed.

LAKE SUPERIOR IRON MINES.

The shipments of mines on the Mesabi range sending ore over the Duluth, Missabe & Northern road were 2,626,384 gross tons, an increase of 297,664 tons over 1897. A number of changes are noticeable. The Franklin mine made a large increase. The Oliver properties fell off more than 300,000 tons; but this was made up by purchases of Franklin and Pillsbury ore, while some Ohio ore was mined by the Oliver Iron Mining Co. in a portion of the deposit abutting on the Lone Jack. The following statement shows the shipments for the past two years:

	1898.	1897.
Franklin,	200,273	30,128
Adams,	390,770	175,800
Commodore,	77,946	60,797
Lone Jack and Mesabi Mountain,	385,792	601,072
Mountain Iron,	650.021	773,538
Rust,	38,385	. . .
Burt,	15,274	. . .
Hull,	75,851	. . .
Pillsbury,	99,691	. . .
Ohio,	65,579	. . .
Sellers,	112,763	. . .
Biwabik,	383,179	427,466
Duluth,	112,155	. . .
*Lake Superior group,	. . .	259,910
Day,	18,725	. . .
Totals,	2,626,384	2,328,720

*The mines in the Lake Superior group (Hull, Burt and Rust) are given separately for 1898.

The Conneaut docks made an excellent record the past season. The tonnage handled included about 1,400,000 tons of ore, 75,000 tons of rails and 25,000 tons of scrap The new dock now under construction will practically double the facilities at this port and the expectation is that close to 3,000,000 tons of ore will be handled next season.

When the new hoisting plant for the Cundy mine is installed the machinery now in the latter will be removed to the Youngstown mine, which the Illinois Steel Co. acquired some years ago but has not operated.

The Hemlock River Mining Co. offers the following scale of wages, to increase its working force: Trammers, $1.60 a day; machine helpers, $1.75; machine men, $1.85 to $2.15.

The Commonwealth Iron Co. is sinking a shaft on the old Buckeye property, about a mile from the Badger mine. It will be put down about 300 feet.

At the Atlantic mine, Gogebic range, a new shaft will soon be completed, a depth of 700 feet having been reached.

A cave-in at the Dunn mine Nov. 27 lost the shaft and it is reported will result in the closing down of the property. The Dunn was at one time the leading producer in the Crystal Falls district and the ore was of a character that made it popular for the production of foundry iron. For the past five years the output has been decreasing, and for two years, since the mine passed under the control of Ferdinand Schlesinger, a considerable percentage of the ore taken out has come from the removal of pillars. This work was stopped last year by an injunction secured by the fee-owners, but it was resumed under an adjustment later.

At the Fayal mine, Eveleth, Minn., two steam shovels are at work day and night on a stripping contract. A waterway 3,500 feet long, 15 feet deep and 12 feet wide has been dug to change the course of a small stream. Two new shafts have been opened up in connection with the past season's work at the Fayal.

An Associated Press dispatch dated Washington, Dec. 2, says: "Several members of the extensive English ship building and ordnance firm of Vickers' Sons & Maxim arrived here to-day after a tour of inspection of the larger ship building and ordnance plants of this country. The party consists of S. Loewe, managing director of the company, and Messrs. John Crosley and James Dunn, technical experts in naval architecture and ordnance. They came to this country some weeks ago to settle extensive war contracts and to consider certain propositions relative to establishing branches in this country. Members of the party said to-day that their business was entirely apart from the Government, except in closing up war contracts, and that there was no purpose of securing Government approval of any of their projects. The main purpose, it was stated, was to get an idea of the extent and value of the leading American shipbuilding and ordnance establishments."

FINISHING UP THE TIN PLATE COMBINE.

The work of putting the tin plate consolidation in running order is being prosecuted vigorously. Friday and Saturday of last week a meeting of the subscribers to stock was held at Pittsburg, this including almost all the tin plate manufacturers. At this meeting the details were arranged for taking a complete inventory at each plant of the stocks of various sorts, during the shut down of this week. A checking list was arranged, a representative from each mill in the arrangement being delegated to check the list of some other mill. The inventories will include stock of raw and finished material, material in process of manufacture, etc An effort has been made to get rid of accumulations of scrap as much as possible before the inventory is taken. It is understood that a board of 13 directors was chosen, but the names cannot be learned. The charter is to be taken out at once, and stock will be issued shortly thereafter. The name will be the American Tin Plate Co. or the Consolidated Tin Plate Co., in all probability. The new company will operate the plants after the resumption of work, which will occur at each mill as soon as the taking of the inventory will permit, and some arrangement is to be made whereby the old companies will share in whatever profits are made up to the first of the year. As prices have advanced materially of late, the recent sales for December delivery are expected to net considerably more profit than came from the business in the summer. There has been considerable activity in the tin plate market during the past week, the selling being, of course, wholly by middlemen, who have large blocks of tin plate contracted for some time ago, the deliveries running through the first half of the year, and in some cases further. Sellers have been unwilling to go beyond the first quarter of the new year, for which deliveries some good sales have been effected at prices ranging from $2.67½ close up to $2.80, for 100-lb. plates, Pittsburg or Indiana mill. Middemen, being in doubt as to the future course of the market, are evidently trying to make a sure thing of it by selling a part of their holdings at the present advance, and holding the balance for any further advance, should it come.

While information regarding the present working and future policy of the consolidation is guarded with the greatest care, it is the general testimony that everything is being done, and will be done, in the most business-like manner. It is impossible to learn of any arrangements having been made, or being in progress, looking toward harmonizing interests which might cause trouble in the future. Jobbers in tin plate, large consumers, and sellers of tin plate bars, are all in the dark as regards the policy to be pursued towards them, but there is a general feeling that it may be as well to wait a little while longer before forming an opinion.

For some time the Monarch Brake Beam Co. has had in use a pneumatic riveter, especially designed and set in a yoke, for riveting up the heads and fulcrums on the solid brake beam. The rivets used are ⅝-inch in diameter, and the riveter drives 1,200 of these in 10 hours. In writing of this the Brake Beam Company says that one of the objections heretofore urged against a beam of this character has been the difficulty in obtaining a metal to metal contact between the malleable iron heads and fulcrums, and the steel section known as the compression member. With this riveter, the work is so thoroughly done that the contact between the malleable iron and the steel is complete and perfect, the riveter accomplishing the operation in such a way that it completely fills the scientific purpose of a riveter, viz., that it makes the two pieces riveted together so completely one that they are practically inseparable. By using this pneumatic riveter, and driving the rivets hot, the holes in both the malleable iron and the steel become filled with the hot rivets, thus overcoming an objection heretofore urged, that the riveted sections worked loose.—[Railroad Gazette.

At the annual meeting of the Cleveland Chemical Society, Monday evening, Nov. 28, the following officers were elected: President, E. C. Holten; vice-president, Oscar Textor; secretary-treasurer, Dr. E. J. Hudson; board of directors, Dr. A. W. Smith, G. A. Bicknell.

The works of the Troy Steel & Iron Co., at Breaker Island N. Y., are to be started up, it is reported.

PITTSBURG FOUNDERS AND THE TEST BAR.

Some interesting points were brought out in the discussion of Thos. D. West's paper read at the meeting of the Pittsburg Foundrymen's Association, Nov. 28. The paper was printed in full in these columns Nov. 24, and was entitled "Essentials in Obtaining Comparative Tests of Cast Iron."

Dr. Moldenke showed two samples of the test bars which are now being made under the direction of the American Foundrymen's Association committee. These bars had been broken, and showed the character of the fracture. One was the smallest size of the series, being one-half inch in diameter, and the other the largest, being four inches in diameter. Dr. Moldenke stated that he had already broken a number of the bars in the first two series. The small bars showed considerable variation one from another, while the large ones ran with remarkable uniformity. When tested for transverse strength, three large bars showed in succession, 99 280, 99 460, and 100 120 pounds. The best fractures in each size were saved, and showed very clearly the differences in the character of the fracture due only to size, other elements being similar. It was interesting to know that the company which made the first series of test bars was anxious to learn the results of his tests of them at the earliest possible time, as it was desired to use the information in the regular foundry work of the company. It had already been found impossible to carry out the plan of making the full series of test bars in chilling iron, as in the case of the very small test bars the metal would not flow, being chilled instantly, but as well would be done in the casting as possible.

Mr. I. W. Frank pointed out that a given size test bar cannot be made applicable to all classes of work, and intimated that the results of the investigation would be to recommend different test bars for different kinds of iron, and different classes of work. The quality of the iron should be shown by the various test bars representing the day's work in the foundry.

In reference to the methods used in the casting of the different series of test bars, which are uniform for all the series, Mr. West made these points: (1) That the bars were all cast on end, because, as he had showed two years ago, there were serious evils in casting test bars flat, an inch bar showing a difference of say 300 pounds, in the transverse test, according to which side was up in the test. The bottom side would be denser and closer in texture. In larger bars, of course, this would be less noticeable. No engineer, in testing steel for tensile strength, would think of taking a specimen which was not uniform in texture throughout its cross section. The vertically cast bars thus far made showed a uniform appearance all around. (2) All the bars in a given series were cast at one time, because in previous experiments, casting the bars in rotation, from 30 to 45 minutes would elapse from the first bar cast to the last, and it was evident that in such cases there would be a great change in the temperature of the iron, thus materially affecting the results. (3) The great range of size in the different test bars was adopted in order to show which was the best size to adopt as a standard. If by this method a dozen one-inch test bars were cast in a row, they would show very close results, and with larger bars the results would be still closer. The limit in the power of testing machines made it necessary to adopt an upper limit in the size of the bars. In the small sized test bars, say the one-half inch, it was peculiar that the poorest iron would show the greatest strength. In the inch bar, there were shown the gradual rise in strength with the better metal.

Dr. Kreutzpointner, of Altoona, engineer of tests for the Pennsylvania Railroad, congratulated the American Foundrymen's Association on the work being done under its auspices in this matter of casting so large a number of experimental test bars. He felt sure this work would help to make standards here and in Europe. His experience was that the larger the test bar the better. The conditions would vary in small test bars. He had found a two-inch test bar good. He would like to see a few of the bars turned or planed, so as to show the comparison between test bars machined and those not. It was a known fact that there would be a difference of from 10 to 25 per cent. Dr. Moldenke here remarked that this was being done, half the bars being tested without machining, and the other half with. Machining relieves the casting strains, and makes the bar show better results. Dr. Kreutzpointner had observed much trouble with machinery castings, due wholly to casting strains. He mentioned a cross-head of cast steel which had broken. It was claimed that this was due to faulty design, but he felt certain that it was due to casting strains. Taking two opposite portions of the cross-head, he broke one under a steam hammer with a light blow, it being a two-ton hammer. The other specimen taken was annealed, and six full blows were given by the steam hammer without breaking it, but it was bent one inch. It was then straightened, and with four blows it was again bent, this time three-quarters of an inch. It was then bent flat a second time, and with seven faint blows it was bent 1¼ inches, when it broke at a key way. The behavior of this condemned cast steel was such after the annealing that blacksmiths who witnessed the efforts to break it were certain it was wrought iron.

Mr. S. Groves, who recently returned from a trip abroad, mentioned a book he had seen in Europe detailing the results of numerous tests, the bars being cast with a loop at each end and then pulled. Frequently holes were found in the center. On the suggestion of a molder, similar bars were cast on end, when 50 or 60 bars would be tried in succession which showed no holes. Mr. Groves frankly gave it as his opinion that while these researches were valuable, yet 10 years hence, especially for machinery castings, steel would be used exclusively, iron being used only for floor plates, furnace fronts, sash weights, etc. Dr. Moldenke here asked if these and similar researches were not conducted with the direct object of making iron castings stronger, and thus preventing the decline of iron founding. By reducing the carbon, steel could be approximated, while retaining the manifest advantages of cast iron. Too much weight should not be given to the popularity of steel castings in Germany, because in that country small castings of malleable iron and of steel were the same price, while in the United States, the malleable castings were much the cheaper. In his malleable iron work the tensile strength had been raised from 34,000 pounds per square inch to from 43,000 to 48,000 pounds per square inch. Where a big body is required in the casting, for rigidity merely, steel would be wasted. Dr. Moldenke was ready to admit that if there were no improvement in cast iron, steel would take its place, but that was not the point.

Mr. West also stated that he could not agree with Mr. Groves's opinion. In light work shops, where a grade of castings is made which requires no strength, such as many of the parts of sewing machines, cast iron was eminently the material. He felt sure the use of cast iron would grow rather than decrease.

Mr. J. S. Seaman said the point was how to get the right kind of iron, so as to get greater strength in castings. Cast iron had been steadily getting worse instead of better. Mr. Kebler stated that there had been as much advance in blast furnace practice as anywhere else. There was no doubt, he said, that blast furnace outputs had been greatly increased (Dr. Moldenke interjected here that that was just the trouble), but the furnace could make any kind of iron that the public desired and was willing to pay for. He remembered when from $50 to $100 a ton was paid for pig iron, but Mr. Seaman put in that then the quality was in proportion.

Mr. West could scarcely agree with the opinion that iron was poorer. Since chemistry had been introduced in blast furnace work the iron ought to be better. He was a firm believer in chemistry. Chemistry may explain many things not now understood, if we only go deep enough into it. He did not think the greater output had any bad effect on the quality. This brought the reply from Dr. Moldenke that there was so much wind in the blast furnace and it was so hot, that it tended to burn the iron. The discussion was cut off at this point.

For the benefit of those who had not been present at the former meeting, Dr. Moldenke again exhibited the Le Chatelier pyrometer and explained its action. It was with this instrument that the work was done on which his paper on the relative melting points of white and gray iron was based. A communication was then read from Dr. Wm. B. Phillips, promising to prepare and read before the December meeting a paper on the yard grading of pig iron, with special reference to foundry work. After thanking Mr. West for his interesting paper, and Dr. Moldenke for the work which made Mr. West's paper possible, the meeting adjourned.

BURSTING OF SMALL CAST IRON FLY WHEELS.

BY CHAS. H. BENJAMIN.

Of late years the failures of large fly-wheels have become alarmingly common. Every month brings its record of one or more disasters of this sort, some of them entailing loss of life and serious destruction of property. It is not the purpose of this paper to discuss the causes of such accidents, further than to notice the fact that the high belt speeds and close regulation required in electric plants have been indirectly responsible. Many of the fly-wheels have failed on account of excessive speed, due to disarrangement of the governor and consequent racing of the engine. In some instances it has been difficult to determine the cause, on account of the destruction and excitement at the moment. In no small number of instances, however, the wheels have burst at speeds but slightly above the normal and when the factor of safety was apparently ample. Mr. James Stanwood, of this society, was the first to point out the condition of stress existing in a fly-wheel rim and to show that the bending due to centrifugal force might reduce very materially the bursting speed. This subject was further developed by Prof. Lanza and the probable amount of stress due to bending was indicated as well as its effect upon rim joints. It occurred to the writer that a series of experiments on small cast iron wheels might throw some light on the causes of failure and lead to more rational formulas for design. The quality of the metal in a small wheel is better than in a large, and the stresses due to uneven cooling are much less. The linear speed of rim at which a large wheel will burst will therefore be less than that obtained by experiments on small wheels.

The experiments about to be described were conducted under the immediate direction of the writer at the laboratories of Case School of Applied Science, and he was present at the bursting of nearly every wheel.

The wheels were all of cast iron and were clean, perfect castings. Two diameters were used, 15 and 24 inches, and each wheel was a scale model of some actual fly-wheel designed by a reputable firm. The wheels numbered 1 to 10 had solid rims with the exception of No. 5. Wheel No. 11 was a special wheel. The wheels numbered 12 to 17 had each two joints in the rim and were 24 inches in diameter. All the wheels numbered from 1 to 10 were reduced models of a solid rim fly-wheel, 10 feet in diameter, now in use on a 12x30 Allis Corliss engine in the laboratory. The wheels numbered 12 to 15 were models of the same wheel on a larger scale, with rim joints designed by the writer. The two wheels numbered 16 and 17 were models of the fly-wheel of a Corliss blowing engine.

To give to the wheels the speed necessary for destruction, use was made of a Dow steam turbine capable of being run at any speed up to 10,000 revolutions per minute. The turbine shaft was connected to the shaft carrying the fly-wheel by a brass sleeve coupling, loosely pinned to the shafts at each end in such a way as to form a universal joint, and so proportioned as to break or slip without injuring the turbine in case of sudden stoppage of the fly-wheel shaft.

One experiment with a shield made of two-inch plank (see Fig. 2) convinced us that safety did not lie in that direction, and in succeeding experiments with the 15-inch wheels a bomb-proof constructed of 6x12 inch white oak was used. The first experiment with the 24-inch wheel showed even this to be a flimsy contrivance. In all subsequent experiments a shield made of 12x12 inch oak was used, which represents the apparatus as employed on wheels Nos. 12 to 17. Even this shield was split repeatedly and had to be re-inforced by bolts. The brick piers of the basement furnished havens of refuge for the experimenters and no accidents occurred, but sundry holes in the brick wall, broken hangers, and riddled belting remain as souvenirs of the spiteful force of the flying fragments. The wheels were usually demolished by the explosion. No crashing or rending noise was heard, only one quick, sharp report, like a musket shot.

The determination of the speed offered some difficulties at first, it being too great for the successful use of a counter or tachometer. A commutator of one break was arranged on the fly-wheel shaft and this connected through the battery circuit with an earphone in an adjoining room. This arrangement worked satisfactorily, giving a clear, musical tone, and the number of vibrations corresponded closely to the speed as measured by a reducing counter shaft and speed counter. It was soon discovered that the audible tone produced by the machine itself when running at a high speed corresponded exactly to the tone in the ear-phone, and consequently the ear-phone was discarded. Two observers, having trained musical ears, and provided with tuning forks, had no difficulty in determining the pitch within half a tone, the quarter tones being estimated. The error due to this method did not exceed five per cent, and was probably less than if an attempt had been made to get the speed with a tachometer. The bursting speed of the wheels having rim joints was too low to produce a musical tone with any distinctness, and it became necessary to resort to the tachometer. It was not deemed safe from the observers to apply the instrument directly to the fly-wheel shaft, and a counter shaft reducing the speed from two to three times was employed. Wooden pulleys were used, connected by a band consisting of several

TABLE I.—FIFTEEN-INCH WHEELS.

No.	Rim. Style.	Rim. Diameter, inches	Rim. Breadth, inches.	Rim. Depth, inches.	Rim. Area, sq. inches.	Arms. No.	Arms. Area, sq. inches.	Weight of Wheel, pounds.
1	Solid	15 1/16	2	.70	1 4	6	.46	20.87
2	"	15 1/16	2	.65	1 3	6	.46	20.44
3	"	15	2	.615	1.23	6	.46	19.12
4	"	14 13 16	2	.52	1.04	6	.46	16 62
5	Section I	15 3 32	.....	.....	.....	6	.46	20.87
6	Solid	15 3 32	2	.69	1.38	3	.46	19 25
7	"	15	2	.615	1.23	3	.46	16.56
8	"	14 1/4	2	.475	.95	3	.46	13.58
9	"	14 3/16	1 3/8	.400	.73	6	.46	12.86
10	"	14 1/2	1 3/8	347	65	6	.46	13.00

thicknesses of electrical tape. Careful observations convinced the writer that there was no appreciable slip. The tachometer used was of the usual rotary pendulum type and was calibrated several times by comparison with a speed counter.

Fifteen-inch Wheels.

Test pieces cast from the same ladle as these wheels were broken in the testing machine, and the following average values obtained for the breaking strength: Tension, 19,000 pounds per square inch; cross-breaking, 39,000 pounds per square inch. These wheels were all turned on the face and edges of the rim, and were carefully balanced by winding copper wire around the arms near the rim.

Wheels Nos. 1 and 2 were practically identical in size and

TABLE II.—FIFTEEN-INCH WHEELS.

No.	Bursting Speed. Revs. per minute.	Bursting Speed. Feet per second—v.	Centrifugal Tension $= \frac{v^2}{10}$	Remarks.
1	6,525	430	18,500	
2	6,525	430	18,502	
3	6,035	395	15,600	Thin rim.
4	5,872	380	14,400	Thin rim.
5	2,925	192	3,700	Joint.
6	5,600*	368	13 600	Three arms.
7	6,198	406	16,500	Three arms.
8	5.709	3 8	13 600	Three arms.
9	5.709	365	13,300	Thin rim.
10	5.709	361	13,000	Thin rim.

* Doubtful.

shape, as may be seen by Table I, and broke at the same speed, viz.: 6,525 revolutions per minute, or a rim speed of 430 feet per second. Nos. 3 and 4 were similar to the preceding, save that the rims were turned down thinner. No. 3 burst at a speed of 6,035 revolutions per minute, or a rim speed of 395 feet per second, and No. 4 at 5,872 revolutions per minute, or 380 feet per second. The rims, being thinner, bent more between the arms, so that the rims failed at a less speed. The shape of fracture at the outer ends of the arms in all the wheels usually indicated that the rim broke first midway between the arms, and that then the two parts of the rim flew outward and broke off at the arm.

Wheel No. 5 had two joints in the rim at opposite extremi-

* From an illustrated paper presented at the recent New York meeting of the American Society of Mechanical Engineers.

ties of a diameter. The strength of the joint was designed to be one-third the tensile strength of the solid rim, but the wheel burst at only 2,925 revolutions per minute, with a centrifugal tension of less than one-fourth that of the solid wheels. Nos. 6, 7 and 8 had only three arms, every other arm having been removed from the pattern before casting. The object of this was to show more clearly the bending of rim due to centrifugal force. These three wheels burst at speeds of 5,600, 6,200, and 5,709 revolutions per minute respectively. The figures for No. 6 were obtained with a tachometer and are doubtful, being probably too low. Wheels Nos. 9 and 10 were of the original six-armed type, but with rims turned down to exceeding thinness, as shown in Table I. They each burst at a speed of 5 709 revolutions per minute, or at rim speeds of 365 and 361 feet per sec nd respectively, a reduction of over 16 per cent from Nos. 1 and 2.

These results are summarized in Table II. An examina-

TABLE III.—TWENTY-FOUR-INCH WHEELS

No.	Shape and Size of Rim. Diameter, inches.	Breadth, inches	Depth, inches.	Area, sq. inches.	Style of Joint.	Weight of Wheel, pounds.
11	24	2⅜	1.5	3.18	Solid rim.	75.25
12	24	4 1-16	.75	3.85	Internal flanges bolted.	93.
13	24	4	.75	3.85	" "	91.75
14	24	4	.75	3.85	" "	95.
15	24	4 1-16	.75	3.85	" "	94.75
16	24	1.2	2.1	2.45	Three lugs and links.	65.1
17	24	1.2	2.1	2.45	Two " "	65.

tion of the column containing the values of v in feet per second will show that as the segments of the rim between the arms become weaker as beams, either through increase of length or decrease of thickness, there is a falling off in the bursting speed.

To determine to what extent the strength is affected by bending, values of $\frac{v^2}{10}$ have been calculated. As has been shown by Mr. Stanwood in the paper before referred to, this expression represents approximately the tensile stress on the square inch of section of rim due to the centrifugal force, for cast iron. By comparing these values with the tensile strength of the iron before noted, viz., 19,000 pounds per square inch, the amount of stress due to bending may be estimated. This difference varies from 500 pounds per square inch in Nos. 1 and 2 to nearly 6,000 pounds per square inch in Nos. 9 and 10—being greatest in the wheels with thin rims or few arms. None of these wheels, however, except No. 5,

TABLE IV.—FLANGES AND BOLTS.

No.	Flanges. Thickness, inches.	Effective Breadth, inches.	Effective Area, inches.	Bolts. No. to Each Joint.	Diameter, Inches.	Total Tens. Strength, pounds.
12	11-16	2.8	1.92	4	5-16	16,000
13	11-16	2.75	1.89	4	5-16	16,000
14	15-16	2.75	2.58	4	5-16	16,000
15	15-16	2.5	2.34	4	⅜	20 000

BY TESTING MACHINE.

Tensile strength of cast iron — 19,600 pounds per square inch.
Transverse strength of cast iron — 46,600 pounds per square inch.
Tensile strength of 5-16 bolts — 4,000 pounds.
Tensile strength of ⅜ bolts — 5,000 pounds.

would have been unsafe at the usual limit for fly-wheel rims of 100 feet per second. Wheel No. 10 would have had a factor of safety of over 12 at that speed.

All the wheels numbered from 11 to 17 were of 24 inches diameter. No. 11 was a special wheel which had been in actual use. This wheel burst at 3,670 revolutions per minute, or a peripheral speed of 385 feet per second, which corresponds well with the average speed of the 15-inch wheels. The explosion was very violent, and completely wrecked the shield. The quality of the iron was unknown, save that it appeared clean and close-grained.

Flanged Joints.

The wheels numbered 12 to 15 were of the same model as the 15-inch wheels on a larger scale, but each wheel had two internal flange joints in the rim, midway between the arms, as shown in Fig. 9. The joints were all carefully planed and the holes drilled to match. The wheels were not turned on the face, but were balanced the same as the others. In none of the experiments was there any shaking or tremor, only a dull roar of increasing intensity, then a single sharp report and quiet, except for the hum of the relieved turbine. The proportions of the flanges and bolts are given in Table IV.

TABLE V.—FAILURE OF FLANGED JOINTS.

No.	Area of Rim, sq. inches.	Effect. Area Flanges, sq. inches.	Total Strength Bolts, lbs.	Bursting Speed. Revs. per Min.	Bursting Speed. Ft. per Sec. $= v$.	Cent. Tension. Per sq. in. $\frac{v^2}{10}$	Cent. Tension. Total lbs.	Remarks.
11	3.18	.....	.....	3 672	385	14.800	47.000	Solid rim.
12	3.85	1.92	16,000	.....	.....	.....	.....	Flange broke
13	3.85	1.89	16,000	1,760	184	3.400	13,100	Flange broke
14	3.85	2.58	16,000	1,875	196	3.850	14,800	Bolts broke.
15	3.85	2.34	20,000	1,810	190	3.610	13,900	Flange broke

The bolts used were of steel, and samples of each broken in the testing machine gave the results shown in the table.

Wheel No. 12 burst at a speed of less than 1,800 revolutions per minute, but the exact speed was not recorded. The flanges broke but the bolts were uninjured, except for a slight stretching. No. 13 was a duplicate of No. 12 in every way, and burst at 1,760 revolutions per minute, or 184 feet per second. The bolts were uninjured but the flanges broken through the bolt holes. The flanges of the pattern were then strengthened by adding one-quarter inch to the thickness, the

TABLE VI.—LINKED JOINTS.

No.	Lugs. Breadth, inches.	Lugs. Length, inches.	Lugs. Area, sq. inches.	Links. Number used.	Links. Effect. Breadth, inches.	Links. Thickness, ins.	Links. Effective area, sq. inches.	Rim. Max. area, square inches.	Rim. Net area, square inches.
16	.45	1.0	.45	3	.57	.327	.186	2.45	1.98
17	.44	.98	.43	2	.54	.380	.205	2.45	1.98

BY TESTING MACHINE.

Tensile strength of cast iron — 19,600
Transverse strength of cast iron — 40,400
Av. tensile strength of each link — 10,180

bolts remaining the same. Wheel No. 14 burst at 1,875 revolutions per minute, with a rim speed of 196 feet per second, in this case the bolts failing. This test showed clearly the bending action of the centrifugal force on the bolts, using the inner edge of the flange as a fulcrum. This joint failed first; the wheel then opened like an oyster, fracturing the rim on each side of the joint opposite, the latter joint being left intact.

In No. 15 bolts ⅜-inch in diameter were used, and the wheel failed at 1,810 revolutions per minute, or a rim speed of 190

TABLE VII.—FAILURE OF LINKED JOINTS.

No.	Strength of Links, lbs.	Strength of Rim, lbs.	Bursting Speed. Revs. per Min.	Bursting Speed. Ft. per Sec. $= v$.	Cent. Tension. Per sq. in. $\frac{v^2}{10}$	Cent. Tension. Total.	Remarks.
16	30,540	38,800	3,060	320	10,240	25,100	Rim broke.
17	20,360	38,800	2.750	290	8,410	20,600	Lugs and rim broke.

feet per second. In this experiment the flanges of one joint were badly broken, the bolts remaining whole. The second joint was uninjured, as in No. 14. Two bolts were nearly sheared off at the joint, a phenomenon which is interesting but which the writer is unable to explain. It would indicate that as the bolts stretched and the joint loosened, one side of the joint was more affected by the centrifugal force than the other, causing a shearing action in the joint.

The results are summarized in Table V. It will be noticed that the rim speed is about one-half that of a solid wheel, and

therefore the centrifugal tension about one-fourth. The joints in all the wheels were carefully made, and were relatively stronger than many joints in fly-wheels, which are running to-day in our mills and shops. The centrifugal tension at the joint would be greater than that given in Table V. on account of the weight of flanges and bolts. At a rim speed of 100 feet per second, these wheels would have a factor of safety of about 3 6-10, which is altogether too small.

Linked Joints.

Wheels numbered 16 and 17 were of the familiar rolling-mill type, with the joints connected by steel links over cast iron lugs, the links being heated and shrunk on. The dimensions of the lugs and links are given in Table VI.

Wheel No. 16 had three links to each joint, one on each face and one inside. This wheel burst at a speed of 3 060 revolutions per minute, or 320 feet per second. Each joint broke on one side, through the rim, without shearing the lugs or breaking the links.

In No. 17 the link was omitted from the inner lug, leaving but two links to each joint. This wheel burst at a speed of 2,750 revolutions per minute, or 290 feet per second. On one side the rim broke as in No. 16; on the other side the lugs failed by breaking off. It is impossible to say which joint failed first. It is thus seen that No. 16, with three links, broke at a speed 66 per cent in excess, and No. 17, with two links, at a speed over 50 per cent in excess of that of the wheels with flanged joints. From the summary in Table VII. it will be noticed that the strength of the rim at the weakest section is apparently in excess of the strength of the links, whereas it was the rim that failed in each case. It must, however, be remembered that the links were under direct tension, while the rim was subjected to bending in addition. At 100 feet per second the factors of safety for Nos. 16 and 17 would be 10¼ and 8 4-10 respectively.

Conclusions.

1. Fly-wheels with solid rims, of the proportions usual among engine builders, and having the usual number of arms, have a sufficient factor of safety at a rim speed of 100 feet per second if the iron is of good quality and there are no serious cooling strains.

In such wheels the bending due to centrifugal force is slight, and may safely be disregarded.

2. Rim joints midway between the arms are a serious defect and reduce the factor of safety very materially. Such joints are as serious mistakes in design as would be a joint in the middle of a girder under a heavy load.

3. Joints made in the ordinary manner, with internal flanges and bolts, are probably the worst that could be devised for this purpose. Under the most favorable circumstances they have only about one-fourth the strength of the solid rim and are particularly weak against bending. In several joints of this character, on large fly-wheels, calculation has shown a strength less than one-fifth that of the rim.

4. The type of joint exemplified in Nos. 16 and 17 is probably the best that could be devised for narrow-rimmed wheels not intended to carry belts, and possesses when properly designed a strength about two-thirds that of the solid rim.

It is gratifying to notice the fact that since the subject of joints in fly-wheel rims has been so thoroughly ventilated during the discussions before this society, several of our prominent engine builders have changed the designs of their wheels by bringing the rim joints opposite the ends of the arms. The experiments which have just been described, although at times a trifle too exciting, were interesting from first to last. The writer hopes to supplement them by others on models of the more recent rim-joints, and would be glad to receive any suggestions.

The more this subject is agitated, the less shall we have occasion to mourn the destruction of life and property on account of faults in the design of this most necessary element of the steam engine.

STOCK columns of the daily newspapers state that the Carnegie Steel Co., Ltd., distributed $5,000,000 among its partners last year, besides making large expenditures for additions—a statement that was gossip in the iron trade some months ago.

WORK AT LAKE SHIPYARDS.

The *Marine Review* gives this statement of work under way or definitely closed for ship yards on the lakes:

"Ship building companies of the great lakes that build steel vessels already have under contract for next season 12 steel vessels, eight of which are modern freight carriers, two passenger boats, one an oil tank barge, and one a large tug. These vessels will foot up in value a little more than $2,000,000. The combined capacity of the eight freight carriers will be about 59,000 net tons. In addition to these steel ships it is announced that James Davidson, of West Bay City, will build at least two large wooden freighters, and there is a probability also of a few wooden vessels of the medium class being built at other points around the lakes. Orders thus far placed are divided among the different builders as follows: Chicago Ship Building Co., Chicago.—Steel screw passenger and freight steamer for Northern Michigan Transportation Co., of Chicago; steel freight steamer and steel tow barge, each of about 8,000 net tons capacity, for Minnesota Steamship Co. Globe Iron Works Co., Cleveland.—Steel freight steamer, a duplicate of the Morse, largest ship on the lakes, for Bessemer Steamship Co.; steel freight steamer, also of modern type, for John Mitchell and others of Cleveland. Detroit Dry Dock Co., Detroit, Mich.—Steel side-wheel passenger steamer for service between Erie and Buffalo; steel tug for army engineer service on Puget Sound. Cleveland Ship Building Co., Cleveland.—Two steel steamers, both of modern type, for A. B. Wolvin, of Duluth, and Capt. Thomas Wilson, of Cleveland. American Steel Barge Co., West Superior, Wis.—Steel tow barge of about 8,000 net tons capacity, for Bessemer Steamship Co.; steel oil tank barge for Standard Oil Co. Craig Ship Building Co., Toledo, O.—Steel freight steamer of Welland canal dimensions, on builders' account. James Davidson, West Bay City, Mich.—Two wooden schooners of about 4,500 net tons capacity each.

"There is still, of course, room for more new keels in the steel yards, although probably not for delivery until August of next year, unless in the case of the Detroit Dry Dock Co., which has no big orders as yet, or the Union Dry Dock Co., of Buffalo, which has not, as far as can be learned, booked any new work. Considerable figuring is still going on for new vessels in all parts of the lakes. It is understood that as a result of the large amount of work again under contract at the works of the Chicago Ship Building Co., the engine works of that concern will very probably be doubled in size. The engine works of the Chicago—an excellent shop with the very latest tools—has been in operation ninth and day ever since it was built. The two vessels to be built at Chicago for Pickands, Mather & Co., of Cleveland, representing the Minnesota Steam Ship Co., are to be out in June and July next. The steamer is to be 430 feet keel, 50 feet beam, and 28½ feet depth, and the barge of the same breadth and depth, but of 436 feet keel. The steamer will therefore be about the size of the Superior City, and the barge about the size of the Fritz and Roebling, of the Bessemer fleet."

China as a Buyer of Railroad Material.

Not a little has appeared in the newspapers lately about the prospects for railroad operations in China, calling for a large tonnage of American rails and equipment. The *Railroad Gazette* says of the outlook for this trade: "The railroad situation in China is by no means clear. By our last letters we learn that the agreement for railroad and mine loans to apply to the extension of the Imperial Railways of North China to New Chwang and to the collieries near Kin Chow was signed at Peking, Oct. 10. We have not learned, however, whether or not this has been ratified by the emperor, or rather by the empress dowager. The emperor has practically abdicated and at present the empress dowager and her followers or advisers are in power and their policy is openly anti-foreign and hostile to railroad and mining enterprises. Therefore, even if the agreements for loans are ratified it does not follow that they can be put on the markets in the present disturbed condition. It is pretty evident that we cannot hope for any steady and large development of railroad enterprise in China until that country has a safer government, and it is further evident that she cannot have a safer government until an end is put to the activities of Russia in pushing forward her plans for the breaking up, if not the absorption, of the empire."

EFFECT OF LONG HEATING ON RIVETS.

At a recent meeting of the Western Society of Engineers, Mr. O. Bates presented for inspection two rivets, showing the effect of long continued heating in an oil furnace. Mr. Bates made this comment: "I do not know what this means, but our bridge inspector brought these two rivets into my office, and he is the father of the experiment. The question was whether steel rivets would be burned in heating. He left these rivets in a furnace at the Lassig Bridge Works. I asked Mr. Lassig if I could send them over here and he made no objection, as they would not discredit him. This rivet, Fig. 1, was 24 hours in an oil furnace; this one, Fig. 2, was in 16 hours. I think that rivet must have been laid to one side

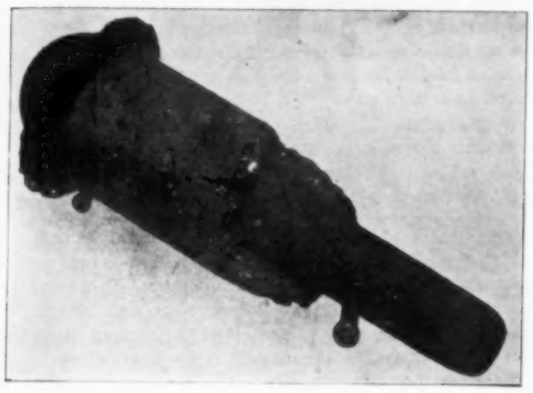


FIG. 1.—⅞-INCH STEEL RIVET LEFT 24 HOURS IN AN OIL HEATING FURNACE. SCALE PARTIALLY REMOVED.

in the furnace, because it looks as if it had not been disturbed. This one, Fig. 2, was taken out and all the scales taken off, then it was bent. This crack was made in bending it backward. The inspector's conclusion was that rivets are not apt

FIG. 2.—⅞-INCH STEEL RIVET LEFT 16 HOURS IN AN OIL HEATING FURNACE. BENT COLD FLAT, CRACKED ON OPENING BEND.

to be injured by remaining a considerable time in the furnace. I do not like to make a rule from one experiment, but as one experiment I thought it well to bring it in and show it."

Mr. Condron suggested that it would be interesting to do the same with iron rivets and see if they would stand continuous heating in a furnace as well as the steel rivets had.

At the annual meeting of the stockholders of the Interstate Malleable Iron Works, of Duluth Minn., held in Minneapolis, Nov. 30, the following board of directors was elected: D. T. Adams, A. S. Chase, J. L. Wiggins, of Duluth; Richard H. Boret, of Minneapolis, and J. L. Strough, of St. Paul, president. Wiggins' report stated that the company was on a sound financial footing, that the plant had been put in good condition, fully equiped with all modern appliances for the manufacture of malleable iron products, and that the books were filled with good orders.

MANUFACTURERS ON THE METRIC SYSTEM.

The advocates of the Metric system, failing to show that it is based on any scientific ground and abandoning the argument that it is either a natural or convenient one to use, still have the claim that it is to be the system of the world, and that it has already been adopted by all nations but England, Russia and America. The advocates in Russia say that England and America are falling into line, the advocates in England say that Russia and America are falling into line, and the advocates here tell the same story about England and Russia. They leave out two important facts in their representations—that the three countries mentioned are a good half of the civilized world, and that people using the English unit do as much weighing and measuring as all other people aspiring to accuracy put together. Again they assume or carry the idea that all the people of the countries whose governments have legalized the Metric system use it. This is not half true! No nation uses it exclusively, not even the French. In the workshops of Belgium and Sweden, two progressive nations, both the English and French systems are used extensively, and the cost of double sets of all sorts of tools and gauges is, and always will be imperative. In some of the countries scarcely more has been done to establish the Metric system than was done here more than a third of a century ago—the enactment of a law making the Metric a legal system of weights and measures.

Allowing that all the advantages claimed for a universal system exist, it would be much easier for the nations now using the Metric system to change to the better English one, as they will in time to the English language, because, half of them already have the English measures, using them still to a considerable extent, and the change, if worth while at all, would be easier. Why the nations who had no standard of their own adopted the Metric system in place of the English was because it was settled by the men who use the pencil rather than those who do the weighing and measuring.

As an evidence that the manufacturers in this country do not favor it—letters of inquiry were sent out to about 70 of the leading manufacturers, and of over 40 replies received, only three favored it, one or two allowed that they would adopt it when compelled, and the rest were utterly opposed to it, and would not adopt it, and yet nearly all these manufacturers are doing a large foreign trade. Whoever will take the trouble to investigate will at once conclude that the cost, as stated by Dr. Sellers, as "millions upon millions," is not overestimated. The cost affects all industries, from the few dollars of the farmer to the tens of thousands of the manufacturer, and what will it save? A lot of figuring claimed by its advocates! While, as a matter of fact, for a time in many cases the figuring will be multiplied ten-fold. All drawings will have to be made anew, or refigured; all tables changed, the engineers' private notes translated; all the constants in formulae will be wrong; records for estimates will have to be corrected, and worst of all every book now printed in the English language, where reference is made to weights and measurers will need to be translated by posterity before they can get a realizing sense of the magnitude of the thing mentioned. What a blessing to posterity, who, it is claimed, are to be the greatest beneficiaries.

A lead pencil will figure just as well in the Metric system as in ours, but the reformers in this case, as is usual, seem to hit upon a plan that puts the burden and bother of the change on other people, and none upon themselves.—[Prof. John E. Sweet in Machinery.

THE TIN PLATE MARKET.

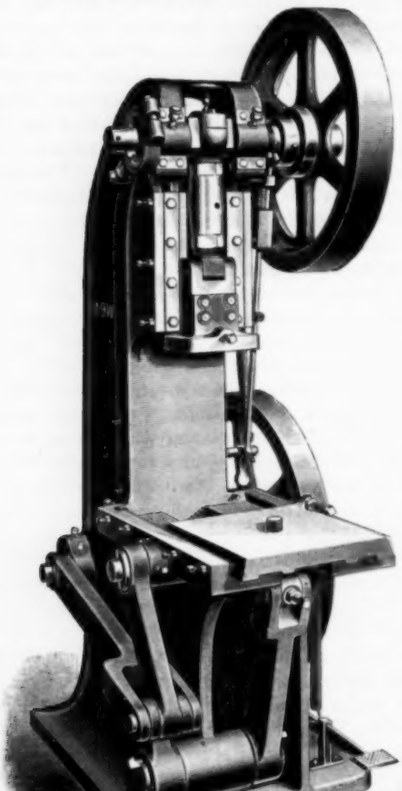
There is a fair amount of inquiry, but owing to the fact that the mills have nothing to sell and that the consolidated company is not in business yet, practically nothing is doing. Some plates are being resold by middle men and the market stands about $2.80 for 100-lb. cokes f. o. b. mill, for the first quarter of 1899.

The tin plate stocks have been quite active on the stock exchange, but there was a sharp decline in the common Monday, this stock selling off six points from the high mark it made Friday preceding.

NEW WIRING PRESS.

The machine illustrated in the accompanying cut has been designed by the E. W. Bliss Co., 6 Adams st., Brooklyn, N. Y., to facilitate the operation of wiring dies for coffee pots, measures, pails, buckets, etc.; also for paneling and lettering dies, for covers, boxes and other similar goods. The slide which carries the die is automatically actuated so as to dispense with the fatigue and loss of time involved in pulling it to and fro by hand. This construction also obviates the risk of accidents caused by the punch coming down on the die before it has been returned to its proper position. An experienced operator can feed the machine at a rate to produce about twice as many finished articles per hour as he could produce on a press with a hand actuated die slide.

The table of this press is cast solid with the frame. When



not in action, the die slide rests in the position shown in the cut. When the treadle is depressed, the clutch is thrown into action, the toggle mechanism carries the die under the punch, where it dwells while the punch makes its stroke and rises, then it is carried out from under the slide where the article in the die may be easily removed. This action may be continuous or intermittent, as desired. Suitable adjustments are provided in both die slide and punch slide. When the shape of the work is such that it is liable to stick in the punch, a clamping device may be applied to the die to prevent this. The press is built by the manufacturers in three sizes, weighing each respectively 1,200 lbs., 2,700 lbs., and 4,000 lbs.

With the closing of the year, the Manufacturers' Advertising Bureau, 126 Liberty st., N. Y., finishes the second decade of its existence. Established in 1879 by the present proprietor, Benj. R. Western, the bureau has grown steadily in public favor and commercial importance. Its clientage is a large one and comprehends representative concerns in nearly every industry in the country. The Manufacturers' Advertising Bureau makes a specialty of the trade journals, and no one knows this class of publications, their conditions and possibilities as begetters of business better than Mr. Western. A booklet bearing the title, "Advertising for Profit," is issued by the Manufacturers' Advertising Bureau. Copies are for the asking, with business card.

BUCKEYE TWIST DRILL GRINDER.

The difficulty of grinding twist drills properly is appreciated by all mechanics who have the work to do. The machine we illustrate is especially desgined to grind accurately and rapidly all twist or flat drills within its scope. The makers compare the impracticability of grinding a No. 60 drill on a machine designed for two-inch drills with the use of a 24-inch lathe to turn up watch pinions. A machine has been especially designed for small drills, and it now is the only machine in the market for that purpose. There is a great demand for

the small machines, and as the builders of this machine are making a specialty of drill grinders, they are continually on the alert to meet varying requirements. Two sizes are now being made: No. 1 grinds from 3/16 to 2¼ inches, No. 0 from 3/16 to No. 60. A larger machine to grind up to five inch drills will be placed on the market in the near future.

These machines are manufactured by the Wilfred Eames Co., No. 11 Allen st., Rochester N. Y., who will send complete descriptive catalogue to all who write them.

Space for American Exhibits at Paris.

Ferdinand W. Peck, commissioner-general of the United States to the Paris Exposition, has recently visited Pittsburg and Chicago on official errands. In view of some misleading and prejudicial publications that have been made concerning Mr. Peck's recent trip to Paris and its results, the following statement of the commissioner is interesting and important:

"The results of my visit exceeded even my own expectations. While in Paris I secured 42,000 more square feet than was first allotted to this country, and since my return I have received a cablegram stating that 12,000 more feet have been granted to us. When I first went there I was informed that the entire apportionment on the Seine had been made and that I was too late to secure a site for a national building, other nations having already secured their sites and submitted the plans for their buildings. But I went ahead, and have succeeded in securing a site for a United States building, fully equal in every way to that of Germany or England. I have also secured 222,000 square feet of space, exclusive of the ground for the Government pavilion, for the exhibits of this country, 54,000 feet of which represents the additional allotment secured—a gain of 30 per cent. The space now allotted to the United States exceeds that of any other foreign country. We will have an agricultural pavilion next to the main agricultural building, a forestry pavilion near the main forestry building and 16,000 feet for the exhibition of manufactures in the heart of the exposition grounds. There will also be fine locations for the exhibition of American passenger trains, marine transportation, our weather bureau, our life-saving service and ample room for field tests of agricultural and other machinery. Beside this, we will have our full share in the annex at Vincennes, which is to be devoted to land and water athletics.

The rolling mill of the Reading Iron Co., situated on South st., Reading, is being torn away to make room for a large addition to the pipe mill. The rolling mill was used for many years for the manufacture of skelp iron on a large scale. All the machinery has been moved to the Oley st. mills. The new addition to the pipe mill will be of brick and iron, and when completed will be fitted with the latest machinery for the manufacture of pipe of all descriptions. It is also likely that the rolling mill near the city limits, which has been abandoned for the last six years, will be remodeled and again put in running order.

Review of the Technical Press.

BY DR. RICHARD MOLDENKE.

Progress in Sheet and Tin Plate Rolling.—*Tin and Terne*, Nov. 17, contains another of the excellent articles of "Fer Blanc" which deal with improvements in the tin plate industry. The present state of the art of rolling sheets from the raw material is characterized as expensive and awkward. The conservatism from which the steel trade in general has emancipated itself and as a consequence has been enabled to enter the world's markets without fear or favor, is still noticeable in this branch of the iron industry to such an extent that an export trade has yet to be developed. The tonnage rates here are too high and consequently American manufacturers just feeling themselves able to take care of their market cannot as yet hope to compete in those countries where lower tonnage rates are the rule. This is the first point made and involves serious questions in the relations between capital and labor. The second point is calculated to help to furnish a solution for the difficulties involved in the first, and that is the improvement of the process. A design is called for which will successfully replace the present stand of two high chilled rolls with or without roughing rolls, for rolling sheets and tin plate. As failures are the rule in this line of inventive effort, "Fer Blanc" gives a summary of the most important requirements for successfully turning out a salable product. First, the rolls must be chilled rolls, with the accompanying ills this class of castings is heir to; then again these rolls must be hot when used, otherwise the metal rolled cools too rapidly. If this consists of a pack of sheets the outside ones are chilled and the result is an uneven "draw." In order to keep very thin sheets hot enough to roll at all a number of them must be bundled together, this also keeping the gauge of each uniform. The passes through which the packs are put must be of the same contour to prevent buckling, etc. Then, also, after a given number of passes the pack is separated so that it may open up readily when finished. The courses open to inventors and designers are now discussed, all evidence of progress lying in the direction of a gradual improvement of each step in the process, so that no injury of an organic nature may result from the miscarrying of any plan. First would come an improvement in the furnaces and doubling shears to reduce the responsibilities and work of the heater and doubler Then come the stands of rolls which, while improved to a great extent in recent years, can still stand a little more of the dose. When it is considered that only highly skilled help enables a manufacturer to run a pair of good rolls for a given time successfully, and a substitution of cheaper men may result in a broken roll at the first pass, one can readily see why tonnage rates are kept so high. The principal improvement called for, therefore, is what "Fer Blanc" calls a "fool proof" roll, a roll which would break the monopoly of skill required to give the best results with the greatest economy. After this the other improvements increasing the tonnage output per man would follow as a natural consequence. This question of improving rolls, however, is one of the most difficult problems to be found in the whole range of foundry work and it is suggested that to get at the solution successfully a whole series of observations must first be made upon which the proper plan of operations may be based. The tensile strength of the iron must be raised to the highest degree possible without impairing the granular structure to too great an extent. Internal strains must be eliminated as much as possible, the co-efficient of expansion due to heat should be uniform and low, the modulus of elasticity as low as possible and the hardness and depth of chill under perfect control. An increase in the elastic limit or practically in the tensile strength of the iron naturally allows rougher usage. If the internal strains due to casting could be at least reduced, if not eliminated entirely, a great gain would result. A reduction of the co-efficient of expansion means a lighter cut taken from the rolls in turning them up hollow. This reduction of the co-efficient expansion is not so easy to bring about, as it would mean a radical change in the composition. The strains set up in a heated roll would be less if this could be accomplished. A very interesting discussion on the modulus of elasticity follows. It will be remembered that the modulus of elasticity is the name given to the ratio of the deforming force to the accompanying deformation, when within the elastic limit. Thus if an external force of 60,000 lbs. be applied to a bar 10 inches long and two square inches in cross section, and if the extension under this load is 0.01 inch, then the modulus of elasticity is 60,000x10 divided by 2x0.01, or 30,000,000. The article concludes with the reiterated statement that no factor is of so great importance in shaping the future of the tin plate and sheet trades of the United States as the improvement of the quality of the rolls which are used in them.

Southern View of the Iron Outlook.

President N. Baxter, Jr., of the Tennessee Coal, Iron & Railroad Co., is thus quoted by the Nashville *American* on the outlook in the iron trade and the present condition of his company's order books:

"The iron market continues firm and of good tone. The trade journals of last week that I have read are very "bullish" on the situation, notably the editorial in the *Iron Age*, and also that in *The Iron Trade Review*. The last numbers of the English iron trade journals report the foreign markets very firm, at prices which are better than any they have enjoyed since 1891. They report recent advances of 75 cents per ton, and, notwithstanding the fact that the productive capacity of all European countries is fully employed, they state that there would be a real scarcity and a probable boom on the other side were it not for the American iron that is going over. The result is that companies located sufficiently near the seaboard to engage in foreign trade are having an unprecedented and extraordinary demand from abroad.

"Since the first of last August my company has averaged in foreign orders 1,000 tons per day, and what I say respecting that is true also with respect to our neighbors and competitors in the Birmingham district. This, of course, as before stated, is unprecedented and extraordinary, and places the Southern furnaces, at least those engaged in foreign business, in a favored position for the maintenance of prices for domestic trade. The stocks of iron on both sides have been depleted greatly in the past several months. Stocks of iron are less materially, to-day than they have been for many years. During the greater part of last year the stocks were 1,000,000 tons and upwards, and they have been reduced, notwithstanding the increase of production, to something over 500,000 tons; and this reduction has taken place largely within the past three months The stocks on hand equal about two weeks' consumption.

"My company had on hand, the first of last August, 63,000 tons, and that supply has been reduced to 15,000 tons. The reduction throughout the country will, in my opinion, be large this month. The stocks of iron in the stores did reach, some time ago, approximately 40,000,000 tons, and they have been reduced, according to the latest reports, to approximately 400,000 tons. Pig iron is going in large quantities from the Birmingham district to almost all the markets of the world, and steel rails and steel in finished forms are going in large quantities from the Pittsburg and Chicago districts to the same markets.

"The outlook for the iron trade is certainly good, and my belief is that, at present, there is less iron in stock in the world than there has been for a very long time. The consumption of iron and steel is much greater at present than at any other period in the world's history."

New Factories at Chicago Heights.

The plant of the American Stove Board Co., now located at 500 to 506 Clybourn ave., Chicago, is to be removed to Chicago Heights, the work of constructing the new factory at that place having commenced last week. The American Stove Board Co makes the ornamental plates on which stoves are placed. The business is large and well established having been in existence since 1864. Two buildings will be erected, for the new Chicago Heights plant, each 80x250 feet, with the addition of a boiler and engine house. Special switches from the Belt Line will be run to the plant, giving the best railway facilities.

Negotiations are now in progress by the Chicago Heights Land Association for the removal to that city of several important manufacturing plants, and as well for the establishment there of American plants of European manufacturing companies. Good shipping facilities, low charges for land, low taxes and water rates are some of the inducements offered.

PNEUMATIC SPRAYING MACHINE.

The accompanying illustration shows the Bean pneumatic spraying machine, for spraying cold water paint, whitewash, or oil paints. It consists of a seamless steel cylinder 44 inches high by 8 inches diameter, with cast top and bottom, secured with four stay rods; a hand pump attachment to furnish air independent of an air compressor or other power; a one-half inch hose, and an 8-ft. bamboo rod, to which an improved spray nozzle is attached, enabling the operator to reach ceilings of ordinary height.

To operate the machine, it is first charged with air to 50 pounds and then fed with liquid compressing the air, which forces it through the hose and nozzle upon the surface to be coated. The great advantage of this machine is that it is not simply a pump, but an independent air compressor, which enables one man to operate it to advantage, thus reducing the cost of maintenance one-half.

The machine is tested to 1,000 lbs. and cannot get out of order. At a recent test one man coated over 23,000 square feet of surface in three hours and ten minutes. The machine is arranged for double hose connection, which gives it twice the capacity if desired. The Rice Machinery Co., 166 S. Clinton st., Chicago, is general Western agent. The company also handles a cold water paint for use in the machine.

SPRAYING MACHINE.

THE Milwaukee *Wisconsin*, in a recent article on the foreign trade of the E. P. Allis Co., says: "David Harlowe, the superintendent of traffic for the Allis people, recently showed to a newspaper man one single paper—a bill of lading—which represented the foreign business of the works in 1894 (we are speaking of large orders only), and in 1895 there were only three orders of this kind. Then in 1896 the bills of lading constituted a fat bundle, perhaps four inches thick, and in 1897 the bundle was just twice as thick. This year, and it is not completed by a month, the bundle of papers representing the foreign orders of the Allis works will be a good-sized armful, and the superintendent was too busy to count them. Some of the current orders for goods were written in Spanish, some in French and languages of various kinds, and had a queer foreign look. Most of them were placed at the home office, though one for mining machinery at La Paz, Bolivia, was sent in by foreign representatives of the firm. Then there was another order for four carloads of mining machinery to Mexico and other goods of the same sort to Costa Rica by way of Panama which were sent by a Yankee railway operating in that Central American state. The Dublin street railway recently ordered two 225-ton engines for its road and the complete equipment of a flour mill is on its way to Valparaiso, Chili. A large consignment of mining machinery and tools were sent to Johannesburg, South Africa, to be used in the gold diggings, and eight cars of goods are going to London to be put in the underground railroad of the world's metropolis. Perhaps the strangest thing of all is to see American steel made into engines and sent across the water to Sheffield, the home of the English iron and steel industry."

Consular Wisdom on the Uehling Casting Apparatus.

Why could not the consuls who furnished this remarkable contribution to the State Department's literature of metallurgical progress, have learned the one significant fact about this "lifting machine," namely that it was an American invention, introduced by American promoters? But perhaps this is asking too much of men—it took two of them, it appears—who could produce such a luminous statement:

Washington, D. C., Dec. 1.—The State Department has received from United States Consuls Boyle and Fleming the following account of the test of a new iron smelting invention in Great Britain: "On Wednesday afternoon there was a large gathering at Millom Iron Works of gentlemen connected with most of the leading iron works in England and Scotland to view the trials of a new pig lifting machine which has just been patented and which, it is claimed, will effect nothing short of a revolution in the manner of casting pig iron at smelting furnaces The new machine, which is patented by the Uehling Company, Ltd., Middleborough, is capable of converting 1,700 tons of molten metal into approved pigs in one day. It has been adopted by the Millom & Askam Iron Works Co., and its practical working on Wednesday was emphatically commended by the representatives of all the firms present. The machine consists of a pouring house, to which the metal is conveyed from the furnaces in ladles. There are two strings of molds that form endless conveyors. These endless chains carry the molds slowly up an incline. In the process of traveling, the pigs are cooled by a spray of water, and the molds are returned quite cool for the next load. The new machine does all the lifting, loading and breaking at a cost of a penny an hour, against 5d. an hour by manual labor."

The Q & C Co., Chicago, has increased largely the capacity of its shops, and is developing several new machines in the line of metal work. This increase of capacity is in view of the favorable outlook.

WORLD'S OUTPUT OF PIG IRON AND STEEL. *

BY JAMES M. SWANK.

On February 21, 1856, the Hon. Abram S. Hewitt, then plain Mr. Hewitt, read a paper before the American Geographical and Statistical Society, at New York, on "The Statistics and Geography of the Production of Iron," in which, for the first time, so far as we are informed, an attempt was made to ascertain the world's production of pig iron. Mr. Hewitt was compelled to estimate the production of several countries but the total production which he obtained for the world was substantially correct. He found that the total production in 1855, 43 years ago, was, in round numbers, 7,000,000 long tons. Great Britain's percentage of the total production approximated 50 per cent, while that of the United States was less than 15 per cent.

Twenty years ago, in a review of the iron and steel exhibits at the Universal Exposition at Paris in 1878, we made an attempt to ascertain the world's production of both pig iron and steel in that year, and the figures then collated from the best available sources we subsequently revised and printed in our annual report for 1889. The results then obtained we now reproduce below, including the percentage of production by each country. Long tons are used for Great Britain and the United States, and metric tons for all other countries, metric tons being used as the equivalent of long tons in ascertaining total production. Our figures show that the world's production of pig iron just doubled from 1855 to 1878.

THE WORLD'S PRODUCTION OF PIG IRON AND STEEL IN 1878.

Countries.	Pig Iron. Product'n. Tons.	Pig Iron. Perc'tage.	Steel. Product'n. Tons.	Steel. Perc'tage.
Great Britain	6,381,051	44.74	1,063,027	36.14
United States	2,301,215	16.13	731,977	24.88
Germany and Luxemburg	2,147,641	15.06	489,151	16.63
France	1,521,274	10.67	312,921	10.64
Belgium	518,646	3.64	102,772	3.49
Austria and Hungary	434,250	3.04	129,416	4.40
Russia	417,239	2.93	66,593	2.26
Sweden	340,858	2.39	25,918	0.88
Spain	60,000	0.42	250	0.01
Italy	20,000	0.14	3,000	0.10
Other countries	120,000	0.84	16,750	0.57
Total	14,262,174	100.00	2,941,775	100 00

It will be seen that Great Britain made 44.74 per cent of the world's production of pig iron in 1878 and that the United States made 16.13 per cent, Great Britain retaining her leadership of 1855 and almost retaining her large percentage of production in that year, while the percentage of the United States in 1878 was almost the same as in 1855, and a very low percentage it was, Germany and Luxemburg making almost as much pig iron as the United States in 1878. Great Britain's production of steel in 1878 was more than one-third of the world's production, while that of the United States was less than one-fourth.

We now present a table showing the world's production of pig iron and steel in 1897, or in the most recent years for which statistics are available, compiled in most instances from official data, the unofficial figures approaching absolute accuracy. Tons are used as in the preceding table. The figures show that the world's production of pig iron more than doubled from 1878 to 1897, and that the world's production of steel increased more than seven fold in the same period.

THE WORLD'S PRODUCTION OF PIG IRON AND STEEL IN 1897.

Countries.	Pig Iron. Year.	Pig Iron. Production. Tons.	Pig Iron. Percentage.	Steel. Year.	Steel. Production. Tons.	Steel. Percentage.
United States	1897	9,652,680	29.30	1897	7,156,957	34.58
Great Britain	1897	8,789,455	26.69	1897	4,585,961	22.16
Germany and Luxemburg	1897	6,879,541	20.89	1896	4,796,226	23.17
France	1897	2,474,143	7.51	1897	1,312,000	6 34
Belgium	1897	1,034,732	3.14	1897	616,604	2.98
Austria and Hungary	1896	1,217,782	3.70	1896	880,696	4.25
Russia	1897	1,868,671	5.67	1895	879,075	4.25
Sweden	1897	538,197	1 63	1897	275,128	1.33
Spain	1897	297,100	0 90	1897	101,800	0.49
Italy	1897	8,393	0.03	1897	63,940	0.31
Canada	1897	53,796	0.16	1897	18,400	0.09
Other countries	1897	125,000	0.38	1897	10,000	0.05
Total	.....	32,937,490	100.00	.....	20,696,787	100.00

The table shows that in 1897 the United States produced 29.30 per cent of the world's production of pig iron and 34.58 per cent of its production of steel, while Great Britain's share of the total production of pig iron was 26.69 per cent, and its share of the total production of steel was 22.16 per cent—the United States having passed since 1878 to the front as a producer of both pig iron and steel, Great Britain taking second place in the production of pig iron and third place in the production of steel, Germany and Luxemburg being second in steel production. The relative position of the United States in the production of pig iron and steel and all iron and steel products will be fully maintained in 1898, as there has been very great activity throughout the year in all branches of our iron and steel industries.

Since the above table was prepared and put in type, we have received the statistics of the production of all kinds of steel in Germany and Luxemburg in 1897. The total production was 5,119 300 metric tons. This production will entitle Germany and Luxemburg to a larger percentage of the world's production of steel than is given in the table, but it will not materially modify the percentage of other countries. It brings up the world's total production of steel to 21,019,861 tons.

* From "The American and Foreign Iron Trade in 1897 and Immediately Preceding Years," prepared for the 19th annual report of the U. S. Geological Survey.

POINTS ABOUT FLASKS.

How long ought a wood flask to last? You can give any answer you please to this query without fear of successful contradiction. It is a question that has never yet been determined. In fact, the question of time is hardly pertinent in this relation. It is rather a question of usage. Some men are old at 40, while others are young at 60. Some flasks are practically worn out by a few months' use, while some last and remain good for as many years.

But just so soon as the foundry foreman doubts the expediency of longer using a flask it ought to be broken up and thrown into the furnace. True, you may compel him to use it longer, and he will probably makeshift to get some good castings from it; but it will be at such expense of toggling, and of break-downs and blowing and scabbing of castings from over-hard ramming, that you had better have taken his advice and thrown the flask away. But these are not the only items of extra cost incident to using "slimpsey," worn-out flasks. It takes a good mechanic to do good work with inadequate tools. It is a very difficult thing to make a good casting in the flask under consideration, and the foreman always gives the difficult work to the better and higher-priced workmen. The number of high-priced men that it is necessary to employ in a foundry, or elsewhere, for that matter, is in inverse ratio to the number of good facilities at hand. Besides, the foreman's time and ingenuity are much drawn upon to make up for deficiencies in facilities.

When they are to have pins instead of hinges, drill them so that the copes and drags will be interchangeable. Perfection is usually a very costly thing; but in this case it costs less than imperfection. In other words, it is much easier and cheaper to drill flask pin holes to templet, so that all will interchange perfectly than to drill each pair to fit separately. And you do not have to make any special templet for the purpose, either. Of course, the lugs must be in the same relative location on all drags, and in a corresponding location on the copes. Then center punch the lugs on one of the drags and drill first with a small (say three-sixteenths) drill, then with a drill to make the hole the full size wanted, ¼-inch being about right. Now, use this drag as a templet by which to drill all the copes, clamp it to the cope in correct position, and, after drilling one hole, insert a pin that will fit closely, so that there can be no shifting, then drill the opposite hole. Use a cope in the same manner as a templet for drilling the drags. If the lugs are exactly opposite each other, that is, at equal distances apart, measured in either direction around the flask, then a drag may be used as a templet for both copes and drags. If these directions be followed, any cope and drag in the whole lot will fit, as to the pin holes, perfectly. To fit the joints so as to prevent rocking, all copes must be fitted to some one drag, and all drags to some one cope.—[E H. Putnam in Tradesman.

THE Harlan & Hollingsworth Co., Wilmington, Del., has introduced pneumatic appliances in its foundry, including a pneumatic rammer for use on large molds.

INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants:—

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

The Niles Mfg. Co. has been incorporated at Chicago, with a capital stock of $15,000 to make brass and iron castings, by Sidney S. Niles, Thomas Gardner and Daniel Flannery.

Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until 2 P. M., Dec. 29, 1898, for a new boiler plant, pumps, and certain modifications and repairs to the power plant and heating apparatus, etc, of the U. S. Appraiser's Building at San Francisco, Cal.

The Maryland Machine Works Co., Baltimore, has been incorporated by Edward W. Phillips, Henry Duvall, Thomas E. Tolley, Harry W. Gaskins and George W. Neal. Capital stock, $50,000.

At Louisville, Ky., the W. E. Caldwell Co. has purchased the Louisville Chair Co.'s Factory and will improve and remodel it. The plant will be used as a machine shop, and it is expected that a building 200x60 feet will be added for foundry and sheet iron tank work. Considerable new machinery will be put in, including traveling cranes, eight-foot boring and turning mill, radial drills, pulley lathe and borer for pulleys up to 40 inches, 36x36 planer and other machines. The company will add to its product turbine wheels, roller mills, portable buhr mills, etc.

The Greensboro Iron Co. has been chartered to operate the Greensboro, N. C., furnace and the mines at Ore Hill. The furnace has never been operated, though built six years ago.

J. S. Hughes and E. E. Wittenberg, of Indianapolis, Ind., formerly with the Atlas Engine Works, have leased the Green foundry at DesMoines, Ia., and after repairs, will start up a jobbing foundry and machine shop business.

The Anchor Fence Co., with factories in Stratford, Ont., South Haven, Mich., Montreal, Kansas City, Omaha, and other points will establish a plant at Memphis, Tenn. H. F. Band is there looking for a site.

New Construction:—

A new two-story building, 40x162 feet, is nearing completion at the Syracuse Malleable Iron Works, Syracuse, N. Y. Another building, 30x70 feet, is to be added.

The Alcania Tin & Terne Plate Co., which is building a tin plate plant at Avonmore, Pa., has let the contract for the buildings, which are of steel construction, to the Shiffler Bridge Co., Pittsburg. There has been delay in getting out the plans and specifications, but it is expected that it will be possible to let contracts for the mills next week.

The South Bend (Ind.) Boiler & Sheet Iron Works, have decided to locate at Waterloo, Ia. The new plant will be erected on the Riverside addition to the city.

Negotiations are reported on foot for the establishment of a tin plate plant at Pottsville, Pa. F. R. Phillips, of Philadelphia, has been in communication with the Pottsville board of trade on the project.

It is reported in Birmingham, Ala., papers that a hoop mill will be built at Ensley City, and that cotton ties will be manufactured.

Work is progressing on the new machine shop of the Ludlow Mfg. Co., Ludlow, Mass., and it will be completed soon.

The Belle City Malleable Iron Co., of Racine, Wis., says that it was fortunate enough to save all its buildings except the molding department from the fire of Nov. 22. The debris was cleared two days after the fire and the company is letting a contract for the immediate erection of a building 800 feet long by 76 feet wide, of brick, to be fitted up with all modern appliances known to the malleable trade. It is the expectation to begin molding in this new department by January 1. The loss by fire was covered by insurance. The company writes: "As most of our employes live about the factory, we have arranged to employ most of them in the erection of the new buildings, and therefore there will be little if any suffering on account of the disaster. Our many customers with whom we have contracts, have arranged to supply themselves with castings for immediate wants, outside, but will return with their patterns as soon as we get matters in shape."

At Wrightstown, Wis., work has begun on a new machine shop for Roebke Bros.

The contract for the erection of the buildings for the new plant of the Alcania Tin & Terne Plate Co., Avonmore, has been given to the Shiffler Bridge Co., of Pittsburg.

The foundry of J. Westwick & Son, Galena, Ill., will be enlarged, practically doubling the capacity of the firm.

J. L. Roberts is to erect a foundry at Walla Walla, Wash.

Nock & Garside, Denver, Col., are erecting a machine shop and warehouse at Denver, to cost $5,000.

The Frankford Steel Works, at Ellwood City, Pa, are building an addition to accommodate a new 10-ton hammer. An electric plant is also being installed.

Work on the new shops for the Gisholt Machine Co., Madison, Wis., is under way. The Fuller & Johnson Co., will secure additional room by occupying the shop vacated by the Gisholt company.

An addition is contemplated, to be begun in the spring, it is said, at the plant of the Northern Electric Co., Madision, Wis.

The West Virginia & Pittsburg Road has let the contract for its shops at Weston, W. Va. There will be four buildings.

The Berlin Iron Bridge Co., of East Berlin, Conn., is erecting for the town of Whitehall, Washington Co., N. Y., a riveted girder bridge having a span of about 70 feet. The bridge is of latticed girder type with steel floor beams, and of a design to carry, besides ordinary traffic, the weight of a steel road roller.

There is some figuring at Toronto, Ont., on plans for the erection of a blast furnace by Rogers, Brown & Co. Definite details have not been decided. The location will probably be close to the lake front. A company with a capital of $400,000 is talked of.

Work will begin soon on a new foundry, 60x250 feet, at the American Steel Barge Co.'s yards at West Superior. The company will build engines and do general jobbing foundry work.

A machine shop, 44x130 feet, is being built at Minneapolis, by H. W. Young.

Ground has been broken for a five-story building of steel and brick, to be erected by the Forest City Foundry & Mfg. Co., of Cleveland.

The Hoffman, Billings & Weller Mfg. Co., Gadsden, Ala., has added to its realty 116x225 feet, and will put in more trackage, besides erecting several buildings to enable the plant to melt as much as 100,000 pounds of iron daily.

The West Virginia & Pittsburg Railroad has awarded the contract to McBride, Arnold & Co., at $17,732.15 for the erection of its proposed shops at Weston, W. Va., to consist of four brick structures.

Fires and Accidents:—

Fire Nov. 26 caused $8,000 damage to the plant of the Stevens Mfg. Co., London, Ont., iron and brass founders.

General Industrial Notes:—

The Carpenter Steel Works, Reading, Pa., will work on double turn through the winter, Government orders for projectiles being sufficient to keep them busy for six months.

A new hammer is being erected at the Baker Forge Works, Ellwood City, Pa.

James V. Rose, of Sharon, who lately purchased the brick works at Doubten, O., will remove them to Sharon, adding improvements to make a plant with a daily capacity of 25,000 to 50,000 paving and building brick.

The seamless tube plant of the National Tube Works Co., at Christy Park, near McKeesport, Pa., which was originally built for the purpose of making cold drawn steel tubes is still busy on shells for Eastern firms, who have Government contracts.

In November, the Gates Iron Works Chicago, received orders for mining machinery of a high grade from Australia—upward of 12 car loads, from Western Australia, South Australia, New South Wales and New Zealand. The company has also had large orders from Nicaragua, Mexico, South Africa and England. The orders from England were for the Gates rock and ore breakers.

The strikers at the Bessie Furnace, New Straitsville, O., have returned to work at an advance of 15 cents a day.

All Feed-Water Heaters possess some point of merit or of advantage — but is one just as good as another?

No! Not by a Jug-full!

Each may possess intrinsic merit, but the **Cochrane Heaters** possess a majority of these individual, meritorious features, making them better than any other kind.

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Among recent orders placed with the Lane & Bodley Co., Cincinnati, are a 300-h. p. engine for F. & L. Kahn & Bros., Hamilton, O., a 125-h. p. engine for Geo. Enger & Co., Cincinnati, and an engine of same power for J. Dornette & Bro., Cincinnati. The engine now under way for the Newport Rolling Mill Co., Newport, Ky., is finished so far as the foundry is concerned. The frame is 28x7 feet and weighs 23 tons. The cylinder is 34x27 and weighs 9 tons. The fly-wheel is 30 feet in diameter.

The sale of Ella Furnace, West Middlesex, Pa., has now been postponed to March 9.

Knauff & Esterbrook, manufacturers of fire brick at Etna st. and the C. & P. tracks, Cleveland, report a good trade in brick for metallurgical work—foundries, steel works, etc., and their plant is being operated to its full capacity.

The E. P. Allis Co., Milwaukee, has received a cable order for two engines for an electric lighting station in London. The amount of the order is $70,000. One of the most recent home orders is from the Metropolitan Street Railway Co., of New York, for three more of the 6,000 h. p. vertical compound engines, for its traction plant. The original order of the Allis company from this corporation was for eight engines, and it will now build 11. Negotiations with Mr. Yen for a flouring mill in Shanghai have also been closed. This mill will be built entirely in this country and a force of men will be sent to China to put it up.

The Hilles & Jones Co., Wilmington, Del., has installed an electric plant for power and lighting. The shops are running full force and three nights a week. Recent shipments include several machines for the W. R. Trigg Co., Mare Island Navy Yard, and orders have been received recently from six other ship yards of this country and England.

The Cambridge Iron & Steel Co., Cambridge, O., will soon have ready for operation three new hot mills in the tinning department, which will double its capacity. It is reported that steps are under way looking to the locating of a sheet and tin mill at Byersville, near Cambridge.

At Birmingham, Ala., judgment has been entered in favor of E. N. Cullom of Birmingham, against the Alabama Steel Works Co., of Fort Payne, Ala., for $55,560. Cullom held bonds, and the suit was a friendly one. The company owns a 100-ton steel furnace at Fort Payne. It is now under lease to the Birmingham Rolling Mill Co.

Powell & Colne, of New York, have concluded a contract licensing the Union Iron Works, of San Francisco, to use the Tropenas steel process. On his recent tour in Europe, Irving M. Scott, vice-president and general manager of the San Francisco company, made a thorough investigation of the process. The Union Iron Works are now building a large foundry with a view to working two two-ton Tropenas converters.

Dunbar Furnace, Dunbar, Pa., was blown in Sept. 4, 1898, on by-product coke made by the Semet-Solvay ovens, at Dunbar, and has been running ever since on that coke. During October the furnace made 7,257 tons of pig iron, breaking the best previous month's record by 1,009 tons. In November, it made 7,388 tons of pig iron. This breaks the two months' record by 2,509 tons.

The Aschman Steel Casting Co., Sharon, Pa., is improving its plant, most of the improvement being already contracted for. The company will put in a 12-ton open-hearth furnace and two 15-ton electric traveling cranes, made by the Shaw Electric Crane Co. The generator and electric work will be furnished by the Westinghouse Electric & Mfg. Co., and the engine by the Buckeye Engine Co. A 125-h. p. Wheeler tubular boiler will be installed. The buildings have not yet been let.

The Michigan-Peninsular Car Co.'s scrap mill at Detroit, active for a year, has been shut down and a new one will be built to start in January.

Orders for rolling stock reported by the *Railroad Gazette* are as follows: The Burlington, Cedar Rapids & Northern will buy 400 freight cars. The Chicago, New Orleans & Texas Pacific 500 cars, of which 300 are to be gondola, 100 flat and 100 furniture. The C. B. & Q. has issued specifications for 600 stock and 600 box cars. The Boston & Albany has ordered 300 cars and the Brooklyn Heights Railroad 150 open cars for spring delivery. The New York Central has ordered

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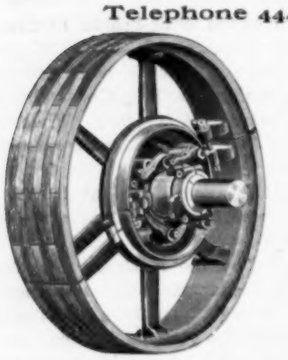

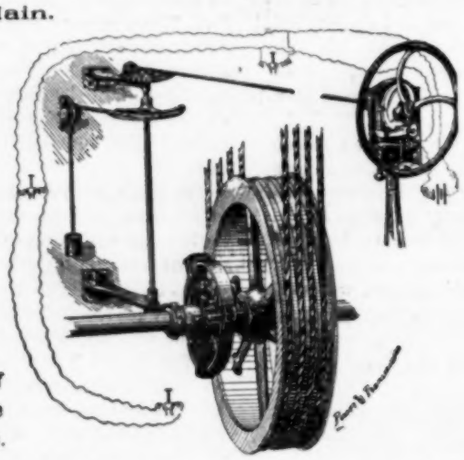

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GENERAL AGENTS FOR THE DODGE INDEPENDENCE WOOD SPLIT PULLEYS.

5,000 cars. The Pennsylvania lines west of Pittsburg, have ordered 400 standard cars and the Gulf, Beaumont & Kansas City, 300 cars. The Chicago & Northwestern has ordered 6 standard Class A eight-wheel passenger engines; the Philadelphia & Reading 10 consolidated freight locomotives; the Erie 5 consolidated locomotives, and the Baltimore & Ohio 50 consolidated engines. It is unofficially stated that the Union Pacific is preparing an order for 40 locomotives. The Lake Shore will let contracts for 45 engines within a week. It is said that the Illinois Central will order 15 to 20 locomotives before Jan. 1.

A deed of trust recently filed at Baltimore by the Tredegar Iron Works, is for the retriement of $294,000 of bonds and the increase of the working capital of the company by $106,000, in view of prospective large contracts from the Government for projectiles and other contracts ahead.

The West Point Mining Co., operating near Florence, Ala., is about ready to take out iron ore. The capital is $50,000. A. A. Berger is president, and N. C. Elting, secretary and treasurer. The company recently put in extensive new machinery, which will make the daily output of the mines 300 tons.

The Niles Tool Works Co., Hamilton, O., has recently delivered the first of an order for two of its heavy armor plate planing machines to a firm in England. Owing to some of the pieces being of too great dimensions to be carried in the

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usual way, they had to be carried specially on a Sunday and the entire line had to be blocked while the train was passing. These tools are probably the largest machine tools that have ever been shipped from the States to England, the table of the planers in question being 12x10x25 feet.

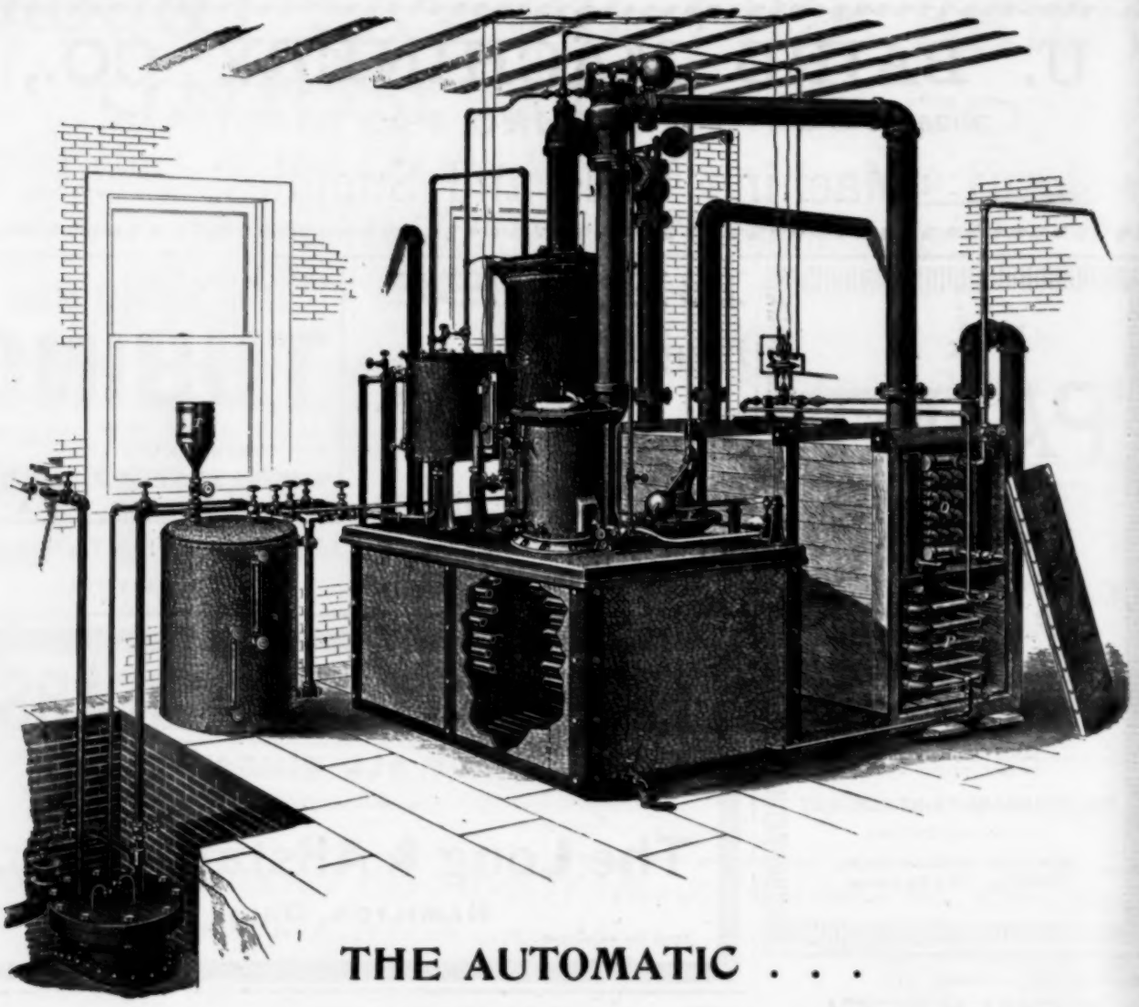
At Dayton, O., a referee was appointed for the Dayton Screw Co.. It is capitalized for $300,000 and the Russell and Erwin Mfg. Co., of New Britain, Conn., owns nearly all the stock. The company is not in debt and does not intend to move its plant. The referee is to receive reasons why the company is not to be dissolved by March 1, 1899.

The Birmingham Rolling Mill Co., Birmingham, Ala., filed a deed of assignment Nov. 30, to John M. Barr, Jr., a director of the company, and Thomas Ward, the general manager. The liabilities are estimated at $200,000. No creditors are preferred. The president of the company, J. G. Caldwell, made a personal assignment in Louisville, Ky., about 10 days ago, and this fact may have caused the rolling mill's creditors to press it. The quick assets are $300,000.

It is probable that the Illinois Central repair shops will be removed to Dubuque, Ia., from Freeport, Ill.

The Cleveland plant formerly occupied by the Paige Car Wheel Co. has shown unwonted activity for some weeks, since the removal to it of two allied industries, the Patterson Foundry Co. and the Ajax Mfg Co. The two establishments have together 36,000 square feet of floor room, divided among foundry, machine shop and forging and erecting shop. The foundry is commanded by a 15-ton electric crane, and the cupola is capable of melting 18 to 20 tons an hour. The foundry is engaged on machinery and other castings, making all the castings for the Ajax Mfg. Co. The machine shop of the latter is now complete; the foundry and forge departments will be fully equipped by Jan. 1. Electricity is employed for lighting and for operating the foundry tumblers in addition to supplying crane power. The specialties of the Ajax Mfg. Co. are bolt headers and upsetting machinery. A large trade has been done in bolt heading machinery, including a number of foreign shipments. Russian, Swedish and German orders have been filled and the company is now figuring on several large orders. F. J. Patterson is general manager of both companies.

Proceedings are pending in courts at Jersey City, N. J., to test the validity of the action of directors of the A. A. Griffing Iron Co., which resulted in the removal of President and General Manager Williams and of Treasurer Tompkins, and the election of A. A. Griffing as president.



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